

Guidance

Laser radiation
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Guidance on events involving laser radiation

based on the **Ordinance to the Federal Act on Protection against the Risks associated with Non-Ionising Radiation and with Sound (O-NIRSA), SR 814.711**

1 Introduction

1.1 Legal foundations

This guidance is designed to show event organisers and competent persons how they can comply with the requirements of the Federal Act of 16 June 2017¹ on Protection against the Risks associated with Non-Ionising Radiation and with Sound (NIRSA) and the implementing provisions of the Ordinance of 27 February 2019² to the Federal Act on Protection against the Risks associated with Non-Ionising Radiation and with Sound (O-NIRSA).

The provisions of the O-NIRSA (Article 10 to Article 17 and Annex 3) specify, on the basis of Article 4 NIRSA, how events involving laser radiation are to be safely conducted by organisers and competent persons.

Organisers and competent persons who conduct their events involving laser radiation in accordance with this guidance can assume that inspections carried out by the Federal Office of Public Health will not determine any non-compliance.

1.2 Definitions of events involving laser radiation

The O-NIRSA is applicable for all types of events involving laser radiation, regardless of whether they are held indoors or outdoors. Under Article 10 O-NIRSA, such events include not only laser light shows, but also holographic projections and astronomy presentations.

Laser light show

A «laser light show» within the meaning of the O-NIRSA is that part of an event in which the laser radiation from a laser device is visible to the audience or third parties. A «laser device» may consist of any number of laser projectors, each containing one or more lasers. Laser devices are assigned to Classes 1, 1M, 2, 2M, 3R, 3B and 4 in accordance with SN EN 60825-1:2014, «Safety of laser products – Part 1: Equipment classification and requirements».

¹ SR 814.71
² SR 814.711

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Holographic projection

In holographic projections, laser holographic techniques are used to display three-dimensional images in an enclosed space. An object can be projected into the middle of a room and viewed from all sides. Holography is frequently employed in films or at exhibitions.

Astronomy presentation

An «astronomy presentation» within the meaning of the O-NIRSA is, for example, an event conducted by an observatory, where stars and constellations are explained with the aid of a laser beam. To date, such events have involved the use of hazardous high-powered, handheld laser pointers, sometimes directly procured from abroad. Such products will be prohibited under Article 23 paragraph 1 O-NIRSA, so that these laser pointers can neither be purchased nor possessed. Astronomy presentations of this kind are now deemed to be «events involving laser radiation» and can no longer be conducted using handheld laser pointers. It is, however, conceivable that astronomy presentations could be conducted using a fixed laser. Such presentations are covered by Article 12 and Article 14 O-NIRSA and require a competent person.

Examples of events involving laser radiation covered by the O-NIRSA

Listed below are examples of events involving laser radiation which are covered by the O-NIRSA and have to be conducted in accordance with the requirements thereof:

- events involving landmark and sky lasers
- events involving laser projections on different kinds of surfaces (e.g. fog screen projection)
- events involving water effects
- events involving a rainbow laser show
- events involving special-effect lasers
- events involving DMX-controlled lasers
- events involving a laser beam bar

- events involving show lasers from all price categories
- events involving a laser harp
- laser tag events³
- use of a self-developed laser product for astronomy presentations (which meet the requirements for events without laser radiation in the audience zone and do not endanger the audience, third parties or air traffic)
- events involving laser holographic techniques

This list is not exhaustive and will be supplemented as necessary.

1.3 Commercial, professional, public and private events

The provisions of the NIRSA and the O-NIRSA are essentially applicable for commercial, professional, public and private events involving laser radiation.

In general, events involving laser radiation are conducted for commercial reasons, as a main or subsidiary occupation, on a regular or occasional basis, in a self-employed or employed capacity. However, laser shows may be conducted not only by professional concert or open air event organisers and club or disco operators, but also, for example, by operators of hotels, restaurants, pubs, circuses, museums, exhibitions, department stores, cinemas, sporting events, sports clubs, fitness studios, swimming pools and wellness centres. Also covered are other, non-commercial events, such as laser shows conducted by private associations, cooperatives and other private entities which organise events involving laser radiation for payment or free of charge. Likewise covered by the O-NIRSA are community events, such as laser shows at school functions or communal lakeside or city festivals.

³ According to the Explanatory Report on the O-NIRSA, laser tag events offered exclusively for adults must comply with the requirements of this Ordinance and are deemed to be events involving laser radiation. Under the Ordinance on the Safety of Toys (SR 817.023.11), if laser tag events are offered for children, they may only be conducted using Class 1 laser devices.

2 General requirements for events involving laser radiation

2.1 Duties of the organiser

The «organiser» is anyone wishing to conduct an event involving laser radiation. An organiser may be an individual or a company. For a notification submitted to the FOPH by a company, an individual's details will also be required.

Events involving laser devices of Class 1 or 2 are to be notified by the organiser to the FOPH via the notification portal no later than 14 days in advance, if the devices emit radiation into airspace.

Any organiser wishing to conduct an event involving one or more laser devices of Class 1M, 2M, 3R, 3B or 4 must engage for this purpose a competent person as specified in Section 3 of this guidance. The organiser is responsible for communicating the following details to the competent person for the notification of the event: company, first name, surname, address, telephone number, e-mail address.

The organiser provides the competent person with written confirmation, in good time, of the latter's engagement for the event involving laser radiation. On request, the organiser can provide the FOPH with evidence of such confirmation at any time.

In the event of an inspection, the organiser grants the enforcement body (Federal Office of Public Health and, for example, a measurement company) such access to premises as may be necessary to assess the laser event.

2.2 General duties of the competent person

The competent person is responsible for the planning, notification, set-up and conduct of an event involving laser radiation. Two types of training are distinguished.

A person with a certificate of competence at level 2 is qualified to:

- plan, notify and conduct, without endangering the audience or third parties, an event involving one or more laser devices of Class 1M, 2M, 3R, 3B or 4, with or without laser radiation in the audience zone;
- plan a safe laser show, submit a notification and instruct a person with a certificate of competence at level 1 to conduct an event involving one or more laser devices of Class 1M, 2M, 3R, 3B or 4, with laser radiation in the audience zone, after a successful test run carried out jointly.

A person with a certificate of competence at level 1 is qualified to:

- plan, notify and conduct, without endangering the audience or third parties, an event involving one or more laser devices of Class 1M, 2M, 3R, 3B or 4, without laser radiation in the audience zone;
- following instruction by a person with a certificate of competence at level 2, conduct, without endangering the audience or third parties, an event involving one or more laser devices of Class 1M, 2M, 3R, 3B or 4, with laser radiation in the audience zone, after a successful test run of the laser equipment, carried out jointly, in accordance with the notification submitted by the person with a certificate of competence at level 2.

The competent person engaged by the organiser:

- must have successfully completed the required training and examination with an examining body listed in the FDHA Ordinance ; or must have had other training qualifications reviewed and recognised as equivalent by the FOPH;
- must submit a complete notification to the FOPH, at least 14 days before the event, via the electronic notification portal (NPL); no other form of notification is permissible;
- prepares the necessary documents for the conduct of the event involving laser radiation (see Section 4);
- conducts the event in accordance with the documents submitted;
- may, at their own expense, have a risk assessment conducted by an accredited measurement company;
- in the event of a determination of non-compliance, bears the costs charged by the FOPH (for additional investigations on the part of the FOPH/ the measurement company, on account of deficiencies in notifications/calculations or measurements, lack of competence, or other compliance failures);
- must comply with the requirements specified in the O-NIRSA for the event involving laser radiation (see Sections 2.4 – 2.5 of this guidance).

2.3 Definition of the audience zone

The «audience zone» is defined as the space up to 3 metres above and 2.5 metres to the side of the floor area reserved for the audience. As shown in Figure 1, «2.5 metres to the side» is taken to include the 2.5 metres in front of (or behind) the audience (in accordance with Technical Report IEC/TR 60825-3).

The «audience» is defined as those persons who are present at a laser show; who, because of their position and proximity, may be exposed to potentially hazardous direct or reflected laser beams; and who are the intended audience for the laser-generated effects.

In the case of a company event involving a laser show, the audience consists of the company employees invited to attend. Generally not considered part of the audience are laser display operators and other event staff and service providers – in particular, performers. It cannot be assumed either that audience members will have been informed about safety procedures relating to the lasers used, or that they will follow safety instructions.

If necessary, the area accessible to the audience is to be enclosed by barriers so as to ensure compliance with the audience zone.

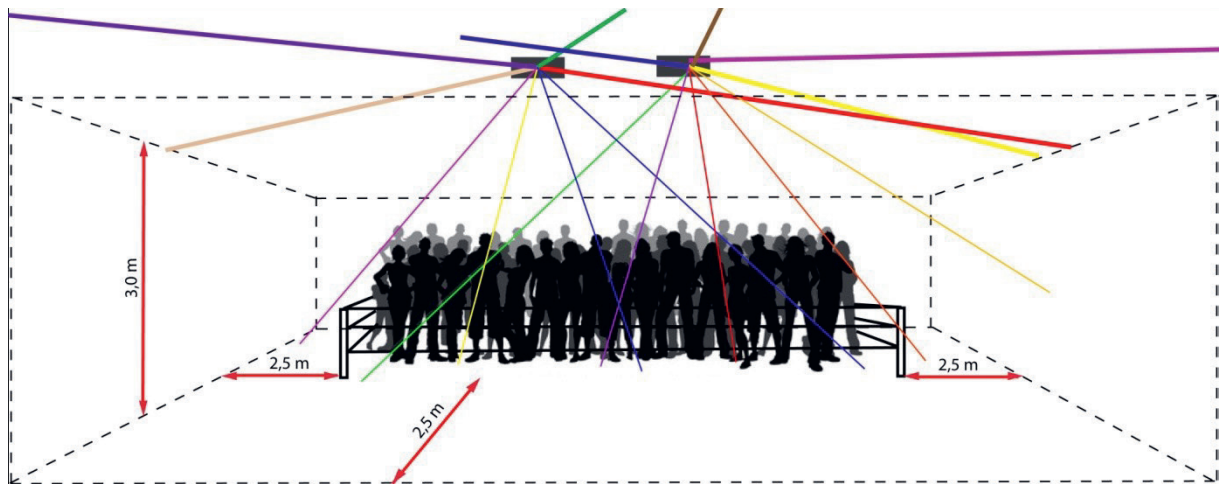


Figure 1. Audience zone. The “audience zone” is defined as the space up to 3 metres above and 2.5 metres to the side of the areas reserved for the audience. This also includes the 2.5 metres in front of the audience. In the audience zone, the maximum permissible exposure (MPE) specified in SN EN 60825-1:2014 must not be exceeded.

2.4 Requirements for events involving laser radiation

The requirements for events involving laser radiation are specified in Annex 3 Number 1 O-NIRSA. These requirements, and compliance with these requirements, are covered in detail in the training and in the examination for the acquisition of competence. In this guidance, therefore, the individual requirements are only briefly recapitulated and explained.

2.4.1 Events without laser radiation in the audience zone

For events without laser radiation (Class 1M, 2M, 3R, 3B or 4) in the audience zone, the competent person must ensure that no laser radiation enters the audience zone. For this purpose, the following requirements are specified in the O-NIRSA:

Laser radiation must not enter the audience zone

During the scheduled performance of the event or in the case of malfunction, laser radiation must not enter the audience zone. This means that the laser device must be appropriately positioned, or laser radiation contained or switched off by physical or electronic means. It must be ensured, by means of barriers and other measures, that no audience members or third parties can enter areas where laser radiation is present.

Secure installation

All optical elements used in the laser show – in particular, laser devices, mirrors and targets – must be securely installed and capable of withstanding external influences, shocks, vibrations and wind.

⁴ Ordinance to the Federal Act on Protection against the Risks associated with Non-Ionising Radiation and with Sound

No reflection

Laser radiation must not strike reflective surfaces or objects in an uncontrolled manner.

Performers, other event staff and third parties

Laser radiation must not endanger either performers or other event staff. This means that the event must be appropriately planned by the competent person. If performers, such as dancers or musicians, or other event staff are exposed to laser radiation, the persons concerned must be appropriately instructed by the competent person. They must comply with the competent person's safety instructions and, if necessary, wear laser safety glasses and protective clothing.

If the event takes place outdoors or if laser radiation could be emitted into the open air, it must additionally be ensured that the laser radiation does not endanger third parties. A more detailed explanation of what is meant by «third parties» in this case is given in Section 2.4.3.

Testing of laser device

Compliance with the above-mentioned requirements must be successfully tested by the competent person responsible (see 3.2) before the event. The time fixed for the test must be indicated in the notification to the central notification portal and must be adhered to. Any changes must be communicated immediately via the notification portal, with the original notification being cancelled and a new notification being submitted with the correct time for the test. The number of the cancelled notification is to be indicated in the «Comments» field.

The FOPH performs spot checks to verify compliance with the requirements of the O-NIRSA.

Supervision of the laser device during operation

Each laser device must be equipped with one or more clearly recognisable and easy-to-operate emergency shut-off devices, so that the competent person present on site can, if necessary, immediately interrupt the emission of laser radiation.

2.4.2 Events with laser radiation in the audience zone

For events with laser radiation (Class 1M, 2M, 3R, 3B or 4) in the audience zone, the competent person must comply with the following requirements specified in the O-NIRSA:

Compliance with the maximum permissible exposure (MPE) during operation and in case of malfunction

During the scheduled performance of the event or in case of malfunction, the laser radiation in the audience zone:

- 1) must not exceed the MPE at the cornea, as specified in SN EN 60825 1:2014, «Safety of laser products – Part 1: Equipment classification and requirements»;
- 2) must not exceed the level of $0.02 \times \text{MPE}$ at the cornea, if the organiser cannot ensure that no instruments such as binoculars are used by the audience.

If binoculars or similar optically amplifying instruments can be expected to be used in the audience zone during the laser show, the MPE is to be multiplied by a factor of 0.02 (98% reduction) to counter the increased risk associated with the use of such instruments.

No reflection

Laser radiation must not strike reflective surfaces or objects in an uncontrolled manner.

Secure installation

All optical elements used in the laser show – in particular, laser devices, mirrors and targets – must be securely installed and capable of withstanding external influences, shocks, vibrations and wind.

Visual contact

The person with a certificate of competence at level 2, or the person with a certificate of competence at level 1 instructed by him/her, must ensure that visual contact is maintained at all times with all laser devices, recognise malfunctions and unplanned hazard situations, and be able to interrupt the laser radiation immediately at any time.

Each laser system must be equipped with one or more clearly recognisable and easy-to-operate emergency shut-off devices, so that the competent person present on site can, if necessary, immediately interrupt the emission of laser radiation.

Performers, other event staff and third parties

Laser radiation must not endanger either performers or other event staff. This means that the event must be appropriately planned by the competent person. If performers, such as dancers or musicians, or other event staff are exposed to laser radiation, the persons concerned must be appropriately instructed by the competent person. They must comply with the competent person's safety instructions and, if necessary, wear laser safety glasses and protective clothing.

If the event takes place outdoors or if laser radiation could be emitted into the open air, it must additionally be ensured that the laser radiation does not endanger third parties. A more detailed explanation of what is meant by «third parties» in this case is given in Section 2.4.3.

Successful test run and emergency procedures

The competent person carries out a successful test run before the start of the event; i.e. the competent person ensures that all the requirements listed under 2.4.2 are complied with and that, in particular, the MPE is not exceeded in the audience zone and all other emergency procedures have been tested.

The time fixed for the test must be indicated in the notification to the central notification portal and must be adhered to. Any changes must be communicated immediately via the notification portal, with the original notification being cancelled and a new notification being submitted with the correct time for the test. The number of the cancelled notification is to be indicated in the «Comments» field.

The FOPH performs spot checks to verify compliance with the requirements of the O-NIRSA.

2.4.3 Events with laser radiation emitted in or into the open air

Under the O-NIRSA, the event organiser or the competent person is responsible for ensuring that laser radiation emitted in or into the open air does not endanger other people; in particular, pilots, airport staff and locomotive or motor vehicle drivers must not be dazzled.

If laser radiation is emitted into airspace, then the competent person (for laser devices of Class 1M, 2M, 3R, 3B or 4), or the organiser (for laser devices of Class 1 or 2), must additionally, via the notification portal, provide details of the precise coordinates and the laser beam direction. The notification submitted is automatically passed on by the FOPH for information to the Special Flight Office (SFO) of skyguide (air traffic control authority). If skyguide objects to the emission of laser radiation into controlled airspace, it will contact the competent person to discuss the next steps.

For risk assessment and planning of laser radiation emission into airspace, one may consult the [FOCA map of restricted zones for drones](#), where no-fly zones (within 5 km of runways) are shown in purple and control zones (CTR) in blue. Outside of aerodromes and control zones (CTR) monitored by air traffic control (see Fig. 2 or map of restricted zones), the competent person must ensure that no hazards arise for aircraft movements in uncontrolled airspace (e.g. Rega air-rescue missions) and that emissions into airspace can be stopped at any time. The competent person must inform all parties concerned about planned emissions into airspace and follow the instructions of the authorities concerned.

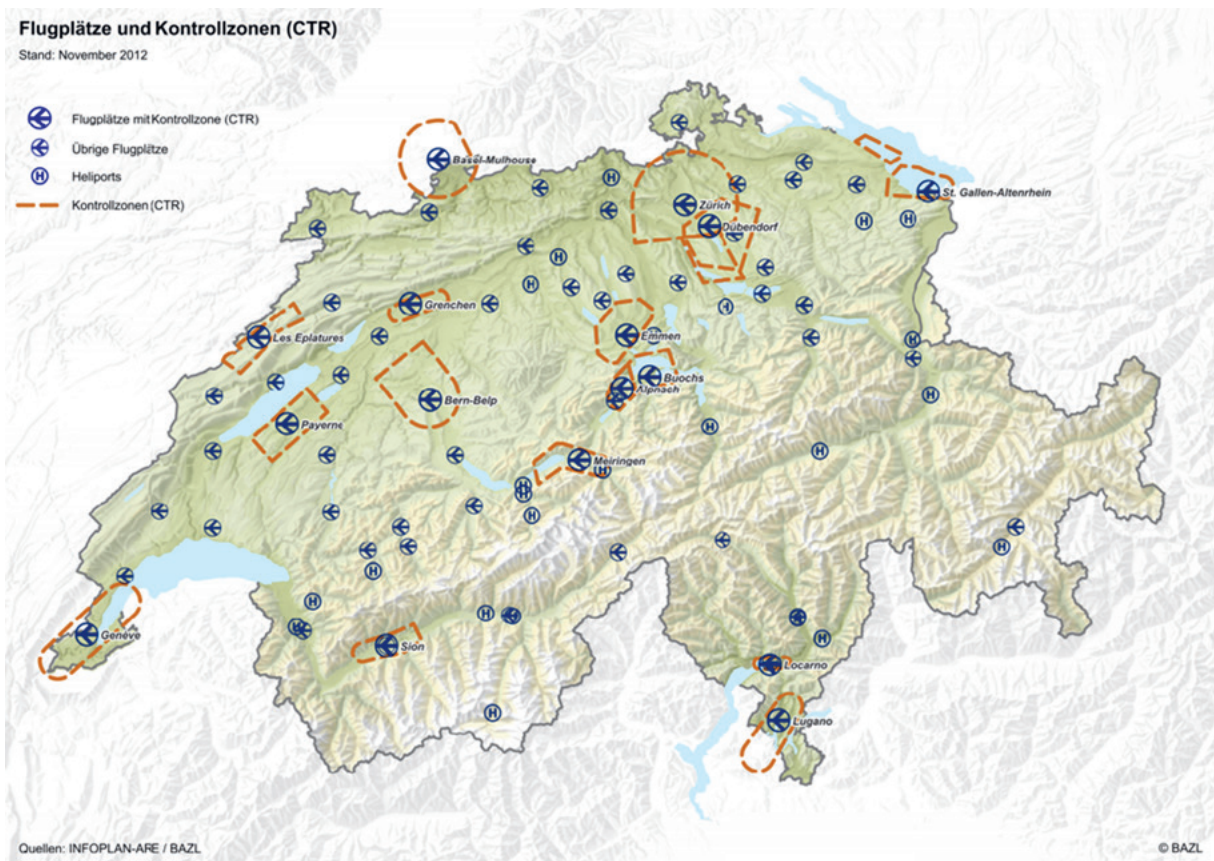


Fig 2. Map of Switzerland showing Aerodromes with control zone (CTR), Other aerodromes, Heliports & Control zones (CTR).

2.5 Requirements for specific laser applications

Specific cases in which lasers are used are described in Sections 2.5.1–2.5.5. This list is not exhaustive and will be supplemented as required.

2.5.1 Laser use in teaching indoors

Laser pointers of Classes 1M, 2, 2M, 3R, 3B and 4 must not be used indoors. Only Class 1 laser pointers may be used indoors, for pointing purposes.

Applications in which laser devices are used in teaching are not covered by the O-NIRSA, provided that:

- the lecture in question involves an experiment in which the characteristics of laser radiation are demonstrated and explained by the teacher/lecturer, and
- this person uses a fixed, not handheld, laser device and can ensure that the students/pupils are not exposed to laser radiation exceeding the MPE specified in SN EN 60825-1:2014, and
- the room with the laser device is not accessible to the public, and
- the laser device is used in an enclosed space and laser radiation cannot be emitted into the open air.

N.B: Laser shows and displays at school functions are covered by the O-NIRSA and are thus subject to mandatory notification and must be conducted by a competent person.

Under the Federal Act on Protection against the Risks associated with Non-Ionising Radiation and with Sound (NIRSA), anyone who installs, uses or maintains a laser product must comply with the manufacturer's safety instructions and ensure that human health is not, or not seriously, endangered. Laser device operators must have at least the necessary basic knowledge in the field of lasers and may be held accountable for any damage under liability and criminal law.

2.5.2 Cross-border laser use

The legislation applicable is that of the country in which a laser device is set up and operated. If the laser device is operated in Switzerland and laser radiation is emitted across international borders, the O-NIRSA must be complied with. This means, in particular, that if radiation from a device of any class is emitted in or into the open air, other persons must not be endangered and, specifically, pilots must not be dazzled.

If one or more laser devices are operated in a region bordering Switzerland and laser radiation is emitted across the border into Switzerland, then the legal regulations of the country in question must be complied with.

2.5.3 Laser applications in national and international research projects

Experimental laser applications in research projects are not covered by the O-NIRSA, provided that:

- the laser system is operated only by persons involved in the research, and
- while the laser system is operated, no audience is present in an audience zone, as defined in the O-NIRSA, and
- the laser system is not accessible to the public and no third parties are endangered.

Although experimental laser applications of this kind do not have to be notified via the notification portal, detailed information on the laser application should be sent in each case to the FOPH via the laser mailbox (laser@bag.admin.ch). If such experimental applications are performed outdoors and laser radiation is emitted into airspace, the FOPH will decide whether the operator also needs to contact the Federal Office of Civil Aviation (FOCA) so that, if appropriate, the closure of airspace for this laser application can be considered and arranged. As soon as such approval has been received from the FOCA, it should also be forwarded to the FOPH laser mailbox.

Laser applications in research projects may include, for example:

- laser-ranging distance measurements for space research
- laser systems for adaptive optics (e.g. laser guide star generation)
- laser lightning rod experiments

2.5.4 Unsupervised operation of laser devices on building frontages for art and advertising purposes without laser radiation in the audience zone and without emission of radiation into the airspace.

According to Article 12 paragraph 2 letter a of the O-NIRSA, any person operating a laser device of class 1M, 2M, 3R, 3B or 4 without laser radiation in the audience zone area must have a certificate of competence at level 1 or 2. It is possible for the device to be operated without this person present on site in the following case:

- Projection onto building frontages for art and advertising purposes in a public space for passers-by (there is no «classic» standing/sitting audience clearly defined in terms of number of people).

The following requirements must be met for a competent person not to have to be present on site during the entire operating time of this laser device:

- The organiser must appoint a person with a certificate of competence at level 2 in accordance with Article 16 paragraph 1 letter a or with a certificate of competence at level 1 in accordance with Article 16 paragraph 1 letter b of the O-NIRSA to report, install, commission and maintain the laser;
- This competent person:
 - o shall ensure by means of barriers and other measures as per Article 12 and Annex 3 Number 1.1 O-NIRSA that neither an audience zone as per Section 2.3 above (area where passers-by may be present temporarily) is irradiated nor third parties are endangered. For this purpose, the beam path of the laser system is limited with metallic or comparable plates in such a way that no laser radiation can penetrate into the audience zone and no third parties can be endangered;
 - o ensures that the laser projection shines only onto the frontage and, in particular, not into airspace;
 - o installs the laser equipment and performs a successful test run before initial commissioning;
 - o conducts regular maintenance and checks on site;
 - o must notify the FOPH of the event in accordance with the O-NIRSA. A serial notification may be submitted, which is valid for up to one year, stating on what days and at what time the lasers are in operation;
 - o must state in the notification that the notification concerns unsupervised operation of laser devices outdoors on frontages for art or advertising purposes;
 - o submits with the notification a plan showing all relevant details of the irradiation of the frontage;
 - o The laser is mounted in a stable manner in accordance with the O-NIRSA so that the laser cannot move under any foreseeable circumstances (wind pressure, snow load, mechanical impact on mounting structure, etc.);
 - o is liable under liability and criminal law for any damage.

2.5.5 Film productions

Laser applications for film productions do not fall under the O-NIRSA provided that:

- no audience is present during the production;
- no radiation is emitted into airspace.

Note: Workers must be protected at all times. Laser applications with laser devices of all laser classes that emit radiation into airspace fall under the O-NIRSA and are therefore subject to notification.

According to the Federal Act on Protection against Hazards from Non-Ionising Radiation and Sound (NIRSA), anyone who installs, uses or maintains a laser product must follow the manufacturer's safety specifications and ensure that there is no or only a slight risk to human health. The operators of these laser systems must have at least the necessary basic knowledge in the field of lasers and can be held accountable for any damage under liability and criminal law.

3 Competent person

3.1 Acquisition of competence

Competence can be acquired with the examining bodies which are listed in the Ordinance of the Federal Department of Home Affairs (FDHA) on Certificates of Competence at Level 1 and 2 for Events Involving Laser Radiation (SR 814.711.31).

3.2 Responsibilities

The relevant responsibilities and training requirements are shown in the following Table.

Event involving laser radiation	VResponsibility	Training	Notification	Laser set-up on site ¹	Conduct of event on site
Laser Class 1 or 2 in an enclosed space	Not regulated, no requirements in the O-NIRSA				
Laser Class 1 or 2 outdoors (or radiation emitted into the open air)	Organiser	None	Organiser (emission into airspace)	–	–
Laser Class 1M, 2M, 3R, 3B or 4 without laser radiation in the audience zone	Person with CCL1 or CCL2	Person with CCL1 / CCL2	Person with CCL1/CCL2		
Laser Class 1M, 2M, 3R, 3B or 4 with laser radiation in the audience zone	Person with CCL2	Person with CCL2	Person with CCL2	Person with CCL2 (if instructed, also person with CCL1)	Person with CCL2/ instructed person with CCL1

¹ Laser show planning, programming, laser device installation, adjustment, testing

4 Notifications via the laser radiation notification portal (NPL)

Events involving laser radiation are subject to mandatory notification (Art. 4 NIRSA), with the exception of events involving laser devices of Class 1 or 2 indoors. They must be notified to the Federal Office of Public Health (FOPH) no later than 14 days in advance (Art. 12–15 O NIRSA).

Notifications must be submitted via the [central notification portal](#). The most important questions are covered in the following FAQs document: «[FAQ](#)»s [Notification Portal](#)

For the various types of event, the following information and documents are to be submitted:

LC 1&2 emissions into airspace	LC 1M, 2M, 3R, 3B or 4 without laser radiation in audience zone	LC 1M, 2M, 3R, 3B or 4 with laser radiation in audience zone
Laser device class	Laser device class	Laser device class
Details of organiser	Details of organiser	Details of organiser
–	Details of person with certificate of competence at level 1/level 2	Details of person with certificate of competence at level 2 (plus, if a person with certificate of competence at level 1 will be instructed to conduct the event, that person's details)
–	Certificate of competence at level 1/ level 2	Certificate of competence at level 2 (plus, if a person with certificate of competence at level 1 will be instructed to conduct the event, that person's certificate of competence)
Details of the event venue and type of event	Details of the event venue and type of event	Details of the event venue and type of event
Date, beginning and duration of event	Date, beginning and duration of event	Date, beginning and duration of event
Details of emissions into airspace (coordinates & laser beam direction)	If applicable, details of emissions into airspace (coordinates & laser beam direction)	If applicable, details of emissions into airspace (coordinates & laser beam direction)
–	Plan of event venue	Plan of event venue
–	Date and time of the laser device test	Date and time of the laser device test
–	–	Description of laser shapes
–	–	Specifications for each individual laser device ²
–	–	Calculation of maximum permissible exposure

2 Manufacturer and type designation, wavelengths, beam diameter at the output port, minimum beam divergence, peak output power for exposure of the audience zone, minimum angular velocity, maximum exposure time of the laser pulse for the eye in the audience zone, minimum distance to the audience zone, maximum reaction time of automatic shutdown in the event of failure, calculated maximum irradiance in the audience zone and comparison with MPE.

Late notifications

If the competent person receives the engagement or enquiry from the organiser after the expiry of the notification deadline (14 days before the event), he/she must still immediately notify the event via the notification portal, with reasons for the failure to comply with the 14-day notification period.

Amendments to the notification

If, as a result of unforeseen changes (e.g. in the plan of the event venue), the notifier has to amend the notification after the expiry of the notification deadline (14 days before the event), he/she should cancel the original notification and submit a new, amended notification.

The number of the cancelled notification is to be indicated in the «Comments» field.

Content of plan of event venue

With each notification, at least one plan of the event venue must be submitted, with the laser device marked, including a ground plan and side view. Using this plan, the FOPH checks whether the necessary safety distances from the audience zone are maintained and whether the audience zone will be subject, at most, to the MPE. In coordination with the emergency planning (emergency procedures, risk management plan), it is to be ensured that no equipment or laser projections obstruct the escape routes and emergency exits.

From the plan of the venue, the following points must be apparent:

- Size of the space
- Audience zone (indicating 2.5 m to the side and 3 m above) marked in green
- If the space occupied by the audience extends as far as the side walls and right up to the front of the stage, for example in a small club, then the audience zone must be shown in the plan extending beyond the walls and the stage area.
- Minimum distance to the audience zone (not the audience)
- Location of all laser equipment:
 - o position and orientation of laser projectors
 - o beam-shaping apertures
 - o projection surfaces, etc.
- All objects connected with the laser show:
 - o reflective surfaces (mirrors, windows, etc.)
 - o mirror ball, etc.
 - o or an indication that there are no reflective surfaces
- Place from where the system is operated
- Facilities such as stage, mixing console, bar
- Escape routes, emergency exits (ensure that no equipment or laser projections obstruct the escape routes and emergency exits)

- Barriers for laser equipment
- For open-air laser events: neighbouring facilities and buildings
- Areas where the maximum permissible exposure is not complied with are to be marked in red

Content of description of laser shapes

For the submission of a notification of an event involving laser radiation in the audience zone, a description of the laser shapes is required. From the description of the laser shapes to be displayed, it should be apparent:

- where the laser beams are scanned within the space
- the minimum beam scanning velocity (speed of change of direction of the laser beam)
- the output power in each case
- in addition, the critical points in the space where the greatest risk exists for the audience (irradiance, duration and repetition rate of laser radiation) are to be specifically indicated.

5 Compliance with the MPE

While the provisions of the O-NIRSA permit exposure of the audience to laser radiation, the radiation in the audience zone must not exceed the specified limit. The laser display is to be planned accordingly, and laser devices are to be set up and operated in accordance with the requirements of SN EN 60825-1:2014. The relevant limit is the maximum permissible exposure at the cornea (MPE), as specified in SN EN 60825-1:2014. MPE calculations must be made for the entire laser event. All the calculations, presented in a comprehensible form, must be uploaded to the NPL in a single document. These calculations will be reviewed by the FOPH.

If binoculars or similar optically amplifying instruments can be expected to be used in the audience zone during the laser display, the MPE is to be multiplied by a factor of 0.02 (98% reduction) so as to counter the increased risk associated with the use of such instruments.

In addition to the MPE calculations, it is also possible for the competent person to have the laser devices measured by an accredited body and the precise specifications calculated and determined. The competent person can then, based on these measurements, check whether the calculations are correct and whether the MPE is complied with in the audience zone. If necessary, the measurement reports of the accredited measurement body can be uploaded to the notification portal together with the MPE calculations. The competent person's calculations for the MPE must be uploaded to the NPL.

6 Enforcement by the Federal Office of Public Health

6.1 Principle

Responsibility for enforcement of the O-NIRSA provisions concerning events involving laser radiation lies with the Federal Office of Public Health. Compliance with the requirements for events involving laser radiation – described in detail in this guidance – is monitored by the FOPH by means of risk-based spot checks. It reviews the content of the notifications received and conducts on-site inspections of notified and non-notified events, also performing measurements for this purpose. The inspections may be announced or unannounced.

6.2 Fees

If reviews of notifications or on-site inspections result in a determination of non-compliance, fees are charged by the FOPH according to the time required, with the hourly rate being CHF 90–200 (Article 26 O-NIRSA). No fees are charged if reviews of notifications or on-site inspections do not reveal any non-compliance.

6.3 Administrative measures and sanctions

Administrative measures are regulated by Article 9 of the NIRSA. Such measures may be ordered, on the premises or subsequently, if inspections reveal non-compliance with the requirements of the O-NIRSA.

The following measures may be taken:

- if the manufacturer's safety instructions are not complied with in commercial or professional installation, use and maintenance, seize and destroy the product or render it unusable;
- order the immediate discontinuation of hazardous exposures;

- in the event of repeated inappropriate commercial or professional use of potentially hazardous products, have the certificate of competence revoked.

In the event of non-compliance, the FOPH can, as an ultimate measure, immediately terminate the laser show. The laser device may also be seized.

In addition, the FOPH can report the following contraventions of the O-NIRSA to the competent cantonal criminal justice authority (Art. 13 NIRSA):

- Certificate of competence at level 2 / certificate of competence at level 1 / FOPH decree lacking or invalid
- Breach of the notification duty
- False declaration or incorrect information in the notification
- Exceedance of the MPE
- Inappropriate installation of the laser system
- Refusal of the competent person to provide information
- Refusal to grant access to the event
- Endangering public safety
- Endangering third parties with laser devices of Classes 1M–4
- Endangering air traffic with laser devices of Classes 1M–4 and/or non-compliance with safety distances

6.4 Checklist for on-site inspection of events involving laser radiation

For on-site inspection of a laser show, the FOPH uses the checklist below. This list is not exhaustive and is designed to provide guidance.

Checklist for on-site inspection of events involving laser radiation

Laser event
Date

	YES	NO	Measures / comments
Access to event and notification			
0 Was access granted to the event?			
1 Was the event notified in advance?			
2 If 1 is answered Yes, was the notification submitted by the deadline?			
Inspection items for emission of laser radiation into airspace			
3 Is laser radiation emitted into airspace?			
4 If 3 is answered Yes, was the emission into airspace notified?			
5 If 3 is answered Yes, were third parties as well as the SFO informed? (Rega,...)			
General assessment			
6 Are reflective surfaces/objects appropriately masked to prevent unwanted reflections?			
7 Are laser projectors, mirrors and targets securely installed and sufficiently capable of withstanding shocks, vibrations and wind, etc.?			
8 Are emergency shut-off devices present and functional? Are they clearly recognisable and easy to operate?			
9 Are the emergency shut-off devices located close to the competent person who supervises the entire event and can intervene if necessary?			
10 Is visual contact with the laser show assured for the competent person?			
11 Are escape routes or emergency exits obstructed by laser equipment or projections?			
12 Are performers and other event staff adequately protected (through protective clothing / safety glasses / compliance with the MPE) and have they been appropriately instructed?			
13 Is the competent person present? (see also 21, 22) (ID matches the certificate of competence at level 2)			
14 Was a test run carried out?			
15 If 14 is answered Yes, were any adjustments then made? Please specify.			
16 If 15 is answered Yes, was an additional test run carried out after the adjustments?			

Laser event
Date

	YES	NO	Measures / comments
Audience zone & exposure:			
17 Are one or more laser devices of Classes 1M, 2M, 3R, 3B or 4 being used?			
18 If 17 is answered Yes, is the audience zone thereby exposed to laser radiation?			
If 17 is answered No, please go on to 19.			
19 Are the physical or electronic screens and the laser device positioned in such a way as to prevent laser radiation from entering the audience zone or obstructing escape routes or emergency exits, either during scheduled operation or in case of malfunction?			
If 19 is answered Yes, please answer 20 – 26			
20 Do the laser devices correspond to the information in the notification submitted?			
21 Is the laser show conducted by a person with CCL1 who was instructed by a person with CCL2?			
22 If 21 is answered Yes, was the person fully instructed? (emergency shut-off, performer safety measures, what may/must be done, audience zone, emissions into airspace, etc.)			
23 Does the audience zone correspond to the plan of the venue submitted with the notification?			
24 Do the safety distances correspond to the plan of the venue submitted with the notification?			
25 Are all elements of the laser devices correctly recorded in the plans?			
26 Do laser beams enter the audience zone, contrary to the notification?			
MPE			
27 Do the parameters/numbers used for the MPE calculations correspond to the situation on-site?			
28 If MPE measurement is performed: Is the MPE in the audience zone complied with? Measurement performed by			