

31.8.2007

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SAFETY REQUIREMENTS AND SURVEILLANCE PROCEDURE FOR HIGH POWER LASER PRODUCTS USED FOR PUBLIC DISPLAY PURPOSES

Finnish Radiation and Nuclear Safety Authority (STUK) inspects high-power laser products (classes 3B and 4) which are used in public displays, before they are taken into use. The operator has always a duty to present the device on-site to STUK for inspection before being taken into use (Supervision-of-Non-Ionizing- Radiation Decree (1306/1993, 4§)).

The arrangements for physical protection relating to the use of display laser products and venues shall comply with the requirements given in a Regulatory Guide on Radiation Safety of High Power Display Lasers (ST Guide 9.4, in Finnish). A summary of main requirements is given in Annex 1. The radiation safety requirements are based on the European standard EN 60825-1 Safety of laser products. Part 1: Equipment classification, requirements and user's guide and to the international technical report CEI IEC/TR3 60825-3 Safety of Laser products. Part 3: Guidance for laser displays and shows. **The operators shall take into account that in Finland audience scanning with lasers is not allowed.**

A notification in writing of public laser displays shall be made to STUK without delay when the venue and date and time of display have been confirmed. The notification shall contain at least the information required in Annex 2. The Annex may be used for giving the notification. The notification shall be given not later than one week in advance of the planned display and the conduction of an inspection shall be possible not later than two hours before the display. In the case of outdoor show a written notification shall be given also to FINAVIA not later than one week before the display.

In Annex 3, contact information of STUK and FINAVIA are given.

- ANNEX 1 Safety requirements for high power display laser products, 3 pages
- ANNEX 2 Notification of a laser display, 1 page
- ANNEX 3 Contact information, 1 page

SAFETY REQUIREMENTS FOR HIGH POWER DISPLAY LASER PRODUCTS

These guidelines relate to the special considerations necessary to provide protection against laser and collateral radiation emitted by high power display laser products. For the purpose of this guidance

- 1) “display” shall include all entertainment, theatrical, stage and set applications, advertising promotions and illuminations and
- 2) “high power laser” shall include all lasers belonging to Class 4 and Class 3B (maximum rated output power being more than 5 mW).

The safety requirements given here are based on the standard EN 60825-1 Safety of laser products. Part 1: Equipment classification, requirements and user’s guide and to the technical report CEI IEC/TR3 60825-3 Safety of laser products. Part 3: Guidance for laser displays and shows. **The operators shall take into account that in Finland audience scanning with lasers is not allowed.**

1 TECHNICAL SAFETY REQUIREMENTS

1.1 Each display laser product shall

- 1) Carry labels in accordance with the requirements stated in the standard EN 60825-1.
- 2) Have a protective housing provided with safety interlocks if appropriate.
- 3) Incorporate a key-operated master control.
- 4) Have a remote interlock connector.
- 5) Have a laser radiation emission warning system that gives an audible or visible warning when it is switched on.
- 6) Incorporate one or more permanently-attached means (beam stop or attenuator) capable of preventing human access to laser radiation in excess of the accessible emission limit for Class 1M or Class 2M.
- 7) Be provided with one or more readily accessible controls which will immediately terminate the emission of any laser radiation.
- 8) Have a scanning safe guard if appropriate if the laser has been classified in the scanning mode to a lower class compared to the class of stopped device.

- 1.2 Each laser product shall have controls located so that adjustment and operation do not require exposure to laser radiation equivalent to Class 3R, Class 3B or Class 4.
- 1.3 Any viewing optics, viewport of display screen incorporated in a laser shall provide sufficient attenuation to prevent human access to laser radiation in excess of the AEL for Class 1M.
- 1.4 Laser radiation outside of the visible range (400 nm to 700 nm) must not exceed Class 1 limits.
- 1.5 Each display laser product and associated optical components, mirrors, etc, should be rigidly mounted to prevent unintended movements or accidental misalignment.
- 1.6 The materials used to terminate laser beams should be non-flammable and absorbent at the relevant laser wavelengths.

2 REQUIRED SAFETY PRECAUTIONS

- 2.1 The maximum permissible exposure level (exposure time 100 s) must not be exceeded at any point.
 - a) less than 3 m above any surface upon which the audience/general public is permitted to stand; or
 - b) less than 2,5 m in lateral separation from any position where a person in the audience/general public is permitted during the display if the performance is under the continuous control of an operator.
- 2.2 The accessible level of laser radiation to operators/performers must not exceed the maximum permissible exposure level. The applicable exposure time is 100 s, if such radiation is intended to be viewed by them in order to perform their functions. In the event that such radiation is not intended to be viewed by them then the applicable exposure time is 0,25 s.
- 2.3 The entrances to areas where lasers are used should be posted with appropriate warning signs according to the standard EN 60825-1.
- 2.4 Any area where the levels of laser radiation exceed the accessible emission limit for Class 1 laser products should be clearly identified, appropriate warning notices posted and barriers erected to prevent the entry of unauthorized persons. Entry into these areas should be undertaken only by authorised persons if necessary and wearing the appropriate protective equipment.
- 2.5 The laser beam must not be intentionally aimed at people.
- 2.6 Precautions should be taken to ensure that persons do not look into the laser beam.

- 2.7 With the laser product must regularly be supplied a user instruction or operation manual that contains adequate instructions for proper assembly, maintenance, and safe use including clear warnings concerning precautions to avoid possible exposure to hazardous laser radiation. A performance check list should also be provided.
- 2.8 Only trained employees may operate the laser equipment. The training should include at least familiarization with system operating procedures and laser safety.
- 2.9 All laser performances shall be under the direct and personal control of the operator(s). The operator shall be located where all beam paths can be directly observed at all times.
- 2.10 When not in use the key shall be removed from the key control or the laser shall be stored in a location where unauthorized personnel can not gain access.
- 2.11
- a) The setting up/alignment of laser systems should only be undertaken by a trained laser operator.
 - b) Only those persons required to perform relevant functions should be present during the alignment/ setting up of the system(s).
 - c) The accessible emission level of laser radiation should be reduced to the minimum practicable level and in any event should not exceed the accessible emission limit for Class 1M and Class 2M laser products.
 - d) Where necessary for the protection of those employed, appropriate protective equipment should be worn during the alignment/setting up of the laser equipment.
- 2.12 A functional check should be made of all safety devices, interlocks, etc, which have been provided to ensure the safety of persons prior to each public use of a display laser product.
- 2.13 The operator shall immediately terminate the emission of laser radiation in the event of equipment malfunction, audience unruliness, riot, mutiny or any other unsafe conditions.

NOTIFICATION OF A LASER DISPLAY

Venue of show: _____

Type of show: Enclosed ___ Open air ___ Permanent ___ Temporary ___

Note 1: If outdoor show, give a notification also to FINAVIA.

Date and time of show: _____ of set up and alignment: _____

Contact person: _____ Telephone: _____

Laser light show company and contact information: _____

Operator(s): _____

Devices:

Type(s) of laser(s), number(s): _____

Wavelength(s) (nm): _____

Maximum rated output power(s): _____

Mode of operation: CW ___ Pulsed ___ Total laser "on" time per show: _____

Laser projector(s)/Other(s): _____

Laser display effects:

Beams/Graphics/Others: _____

*Note 2. Audience scanning is not allowed.**Note 3. The layout of the venue and the design of the laser installation (beam bath diagrams etc.) shall be annexed to the notification.***Information supplied by:**

Date and place: _____

Signature: _____

CONTACT INFORMATION

All laser displays or shows:

STUK
Radiation and Nuclear Safety Authority
Non-Ionizing Radiation Laboratory
P.O.Box 14 (Laippatie 4)
FIN-00881 Helsinki
Finland
Switchboard +358 9 759 881
Tel. +358 9 759 88 454/ Reijo Visuri
Fax +358 9 759 88 450
E-mail: uvjalasertiimi@stuk.fi

Outdoor laser displays or shows:

FINAVIA
P.O.Box 50 (Lentäjätie 3)
FIN-01531 Vantaa
Finland
Switchboard +358 9 82 771/ Marja Hannuksela
Fax +358 9 82 77 2099
E-mail : info@finavia.fi