

LaserVenture - LaserMaze System – Risk Assessment

Note:

Due to changes in regulations in France during 2013, the information below is sectionalised where it applies to (1) France and (2) all other countries unaffected by the recent changes in law.

Product Description

LaserMaze consists of a number of laser beams arranged so as to present obstacles to the player. The idea of the game is for the player to negotiate the beams without breaking any or more than an allowed number of beams and for the player to complete the negotiation of the beams within an allotted time.

The lasers and sensors are connected, via CAT5 cabling, to a small interface, which in turn connects to a control PC running **PinPoint**, the control program.

The system operates at 15 volts DC.

Scope of this Risk Assessment

This assessment and method is confined to the Lasermaze system (The system) itself. Since our customers provide their own maze area and furnishings, they are advised to generate their own risk assessment in respect of the maze furniture to ensure that the risk of physical injury due to players impacting the maze fabric is minimized. For assistance in that respect please consult the relevant section of our [lasermaze-instructions.pdf](#) file.

Evaluating the risks

France (as of July 2013)

The lasers used in systems supplied to France have a maximum output power of 1mW. The beam is modulated with a 90% mark-space ratio, so that the mean power is equivalent to 0.9 milliwatts. The light emitted is visible (red) light in the range 635nm – 650nm, depending on level of the system specification. These lasers are in the class 2. Laser beams in this class are considered to be safe under all conditions of use..

All other EU countries and the rest of the world:

The lasers used in all systems where the laser power is not constrained by international standards have a maximum output power of 5 milliwatts (EU regulation EN60825.1). The beam is modulated with a 90% mark-space ratio, so that the mean power is equivalent to 2.61 milliwatts. The light emitted is visible (red) light in the range 635nm – 650nm, depending on level of the system specification. These lasers are in the class 3R category (IIIR). Laser beams in this class exceed the maximum permissible exposure for accidental viewing and can potentially cause eye injuries, but the actual risk of injury following a short, accidental exposure, is still small. The light aversion reflex should protect the user if only viewed momentarily.

There are two modes of operation of the system, Normal Operating Mode and Set Up Mode. From the risk assessment standpoint, the only difference is that in Set Up Mode, interrupting the beam will not cause the laser in question to be turned off.

Level of Risk

Class 2 – As this class is safe under all conditions of use, the level of risk is negligible.

Class 3R - Given the small actual risk of injury with this class of laser the level of risk is low, as in 1 on a scale of 1 to 5.

Actions to prevent exposure to beams

Methods inherent in the system:

- Interruption of the beam will result in the control program switching the beam off within 100 milliseconds.
- Modulation of the beam allows the sensors to be sure of responding to the laser beam and not to any accidental stray light. Therefore the situation will not arise where the laser beam is interrupted but the sensor remains triggered.
- In the event that there is a communication breakdown between the control PC and the lasers and sensors, whether this be due to removal of a cable, the program being closed, or some other reason, the processors in the individual laser modules will turn off any energised lasers 100 milliseconds after the data stream ceases.
- The beam-collecting surface of the sensor is chosen to ensure that reflected light is at a minimum and that any reflections are scattered, thus ensuring that beams are contained.
- Laser modules have the mandatory caution and aperture labels affixed.

Steps the operator/installer must take to ensure safety

- Class 2 or Class 3R lasers do not require the appointment of a Laser Safety Officer. However, it is recommended that Set Up should only be carried out by assigned personnel, who have been trained to set the system up and understand the implications of laser safety. The system can be easily set up by one person.
 - The play area should be wide enough that players can negotiate the maze without the risk of hitting and mis-aligning the beams, although of course in Normal Operation a mis-aligned beam will be switched off within 100 milliseconds.
 - The walls, ceiling and floor of the maze should be closed and decorated in such a way that in Set Up Mode beams (a) cannot escape the confines of the maze and (b) beams impinging on those surfaces will either not be reflected at all, or only in a diffuse manner.
 - No onlookers should be present during Set Up.
 - If the Set Up personnel have to leave the maze at any time during Set Up they should revert the system to Normal Operating Mode, or better still, power the whole system down.
 - Set Up personnel should endeavour to stay behind the laser module being set up to minimise the risk of looking into a beam.
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- Lasers should be set up one beam at a time, and that beam should be turned off before setting up the next beam.

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