

Weed management – safety requirements for laser outdoor usage

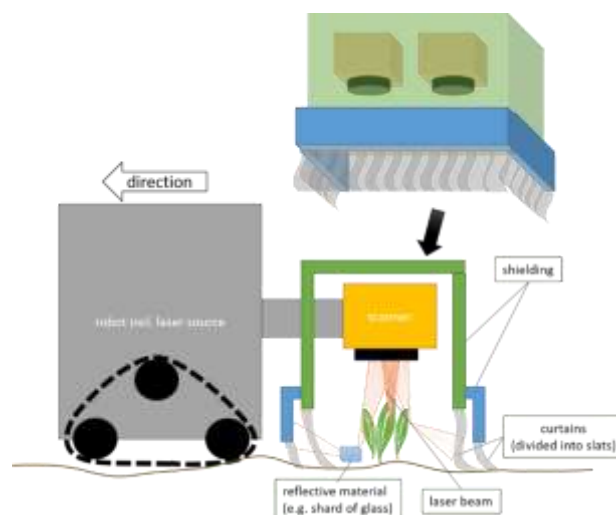
Initial situation

In order to realize the use of lasers for outdoor applications, safety requirements must be strictly complied with to ensure that neither people's health nor the environment is affected by direct and diffuse laser irradiation.

Safety requirements and solution

To realize laser safety in open fields, EN 60825-1, EN ISO 11553-1 and -2 generally apply to safe machine design, and EN 60825-4 in particular applies to a laser-safe enclosure. Since the irradiation of weeds requires an enclosure being open at the bottom, flexible laser-protection curtains are used as lower part of the design, not losing ground contact even in case of bumps. This shall prevent laser radiation from escaping to the environment. Furthermore, monitoring safety sensors detect ground distance, inclination and acceleration of the system. They can switch off the laser via the laser-safety control if necessary.

A divergent laser beam is advantageous if radiation unexpectedly escapes from the laser-safe enclosure. With known divergence angle and laser power, the nominal ocular hazard distance (NOHD) can be calculated, at which the laser irradiance falls below the exposure limit value for the eye (ELV_{eye}) according to Directive 2006/25/EU. Within the area defined by the NOHD, it must be ensured that no one is exposed to laser radiation above the ELV_{eye} . Therefore, LIDAR and proximity sensors shall be integrated into the weeding system to detect people entering the NOHD area and to stop laser irradiation immediately.



Schematic illustration of the shielding to be installed to guarantee laser safety

Practical aspects

The initial laser safety concept has been developed and discussed with the partners. The concept will be assessed as part of the initial laser-weeding setup and further developed as necessary in order to enable safe laser weeding.

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