PROJECT ARLUMEN

Photonics applied to defense: deterrence lasers

Intercepting intrusions in civil and military environments

To protect sensitive and strategic sites against intrusions, the client sought to develop a system capable of deterring intruders.

Arlumen acted as an expert in optics and electronics to design, optimize, and manufacture a high-power laser dazzling device, delivering high performance and maximum safety under real operational conditions.

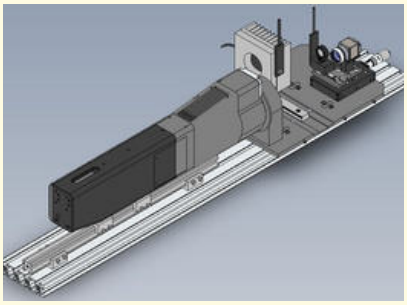


Objective — **Design and manufacture a non-lethal laser dazzling system to intercept intrusions at long range.**

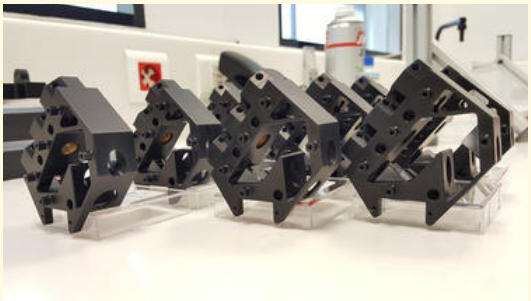
Technological challenges

The laser dazzling system required combining high laser power, maximum safety, and advanced opto-electronic integration. It must:

- Deliver an **output power of 5 W** to ensure effective dazzling at distances **beyond 100 m**.
- Convert an intrinsically hazardous laser (class 4) into a secure, **class 1-compliant** device to prevent any risk to surrounding people.
- Automatically **shut down** the beam if an obstacle is detected **within 100 m**.
- Ensure **multiplexing and coaxial alignment** of the high-power lasers with the Time-of-Flight (TOF) lidar detection laser.
- Integrate **laser thermal control** to guarantee stability and reliable operation.



3D design of the characterization bench



Multiplexing module



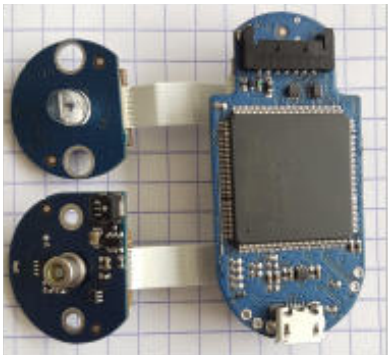
Time-Of-Flight sensor



Solution tailored by Arlumen

Arlumen developed and produced, in small series, a laser deterrence and interception system, which integrates:

- A complex optical system capable of **multiplexing and coaxially aligning** two high-power **green lasers** (525 nm, 3.5 W and 550 nm, 2.1 W) with the 905 nm TOF laser.
- **Beam shaping optics** to create a circular or elliptical **dazzling zone** adapted to various protection scenarios.
- **A dedicated electronic board** for **immediate beam shutdown**, using a **TOF lidar** adapted for a very fast response time, ensuring **laser safety** over a distance of **100 m**.
- **A dedicated control electronics** for the **Peltier module** used for **laser frequency doubling**, ensuring **optimal conversion efficiency** and maximum overall performance.
- **A camera** and **supervision interface** to image the laser spot, verify beam **alignment**, and monitor system **performance**.



Electronics of the Time-of-Flight measurement system

Key performance highlights

- Laser with a **5 W** output power, **class 1 compliant**
- **Automatically triggered** protection system for the first **100 m**
- Automatic laser shutdown time: **<0.1 ms**
- **Temperature control** to ensure laser efficiency
- **Production** of 12 lasers

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