## Dynamic beam steering using Risley prism and variable magnification beam expander

## Aurélie Gregori-Hentz

## LMOPS, CentraleSupélec et Université de Lorraine

## ABSTRACT

Beam steering plays a crucial role in LiDAR and free-space optical communications, where compactness, precision, and adaptability are essential. This work presents a beam steering system that combines the agility of Risley prism with the flexibility of a variable magnification beam expander. The prisms enable the system to perform different scan patterns through relative rotation, while the beam expander dynamically adjusts the angular range, maintaining consistent spatial resolution across target distances ranging from meters to kilometers. This setup achieves high-resolution scans within a few hundred milliseconds using a pulsed laser. Unlike bulky conventional zoom optics, the compact five-lens beam expander offers a wide magnification range, enabling over an 80-fold variation in angular coverage while meeting compactness of the system.

Experimental results confirm the system's ability to adapt scan areas precisely, with image processing used to characterize the scanning performance. This efficient, cost-effective design offers a promising solution for dynamic, long-range optical targeting, with future improvements focusing on lens alignment and control optimization.

