Device for transmitting and detecting optical beams

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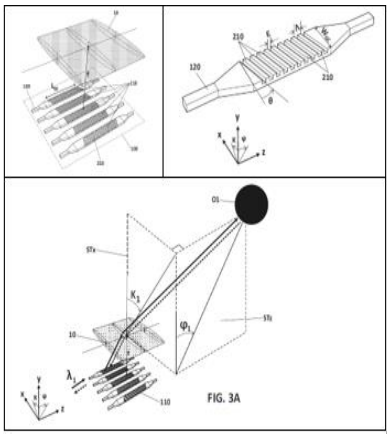
Description



The device for transmitting and detecting optical beams represents a significant advancement in LiDAR technology by integrating all essential components into a single photonic chip. Unlike traditional systems that rely on mechanical parts or multiple separate modules, this innovation ensures a compact, efficient, and scalable solution. It reduces device size, enhances precision, and enables simultaneous transmission and detection of multiple beams. Applicable to both ToF and FMCW LiDAR systems, the device supports high-speed data acquisition, making it ideal for autonomous driving, robotics, and other applications. The environmental friendliness stems from eliminating moving parts, thus reducing energy consumption and wear over time. Its design supports seamless integration with silicon-on-insulator, indium phosphide, and polymer technologies, offering broad commercialization potential across industries.

Key Advantages: Single-chip integration for size reduction, scalability, and efficient beam processing. Compatible with ToF, FMCW, and advanced LiDAR systems, ensuring versatile applicability.

Technical Innovations: Parallel beam processing for rapid data capture without moving parts. Material flexibility supports diverse photonic platforms, enhancing system adaptability.

Innovative aspects and advantages

Innovation and Applications: A compact LiDAR device integrates optical beam transmission and detection on a single photonic chip, applicable in ADAS, drones, and AR/VR.

Tools, Methods and technical advantages: Uses grating couplers, optical waveguides, and tunable laser inputs for precise and multiple beam steering and 3D/6D environmental

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mapping.
Beam Steering Mechanism: Innovatively employs inclination-adjusted grating teeth and variable tooth spacing to steer beams in x and z directions.
Miniaturization and Scalability: Significantly reduces device size, allows handling of many angular pixels, and is scalable for various wavelengths and platforms.
Environmental Friendliness: Solid-state design without moving parts enhances reliability, reduces power consumption, and supports eco-friendly materials.
Commercialization Value: Supports applications in autonomous vehicles, robotics, and topography with faster data capture and compact, low-cost production.
Integration and Compatibility: Integrates diverse photonic chip technologies, including silicon-on-insulator and InP, ensuring compatibility across industrial platforms.
Lens Configurations: Features versatile lens systems, such as cylindrical or Fresnel lenses, for tailored light focusing and compact assembly.
Performance Simulation: Validated through simulations showing high precision in beam deflection, divergence angles, and focus properties, proving reliability and innovation.

Commercial applications and potential users

The device is ideal for LiDAR systems used in autonomous vehicles, advanced driver assistance systems (ADAS), and drones, providing high-precision 3D and 6D environmental mapping. The compact, integrated design enables its use in robotics, topography, and terrain mapping. Additionally, it supports virtual and augmented reality applications, enhancing immersive experiences. Potential users include manufacturers of autonomous vehicles, industrial robots, drones, and AR/VR technologies. The device's scalability, cost-effectiveness, and fast data acquisition make it suitable for commercial products like robotic vacuum cleaners and consumer electronics. It also finds applications in archaeology, sensor systems, and geospatial mapping, driving innovation in multiple fields.

Patent status

- **ES2989226:** Spanish national patent.

Type of collaboration

Looking for industry interested in licensing or joint development of the process and/or product.

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