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IMEC'S HIGH-POWER OPTICAL BEAMFORMING TECHNOLOGIES FOR LIDAR, LI-FI AND TERAHERTZ APPLICATIONS

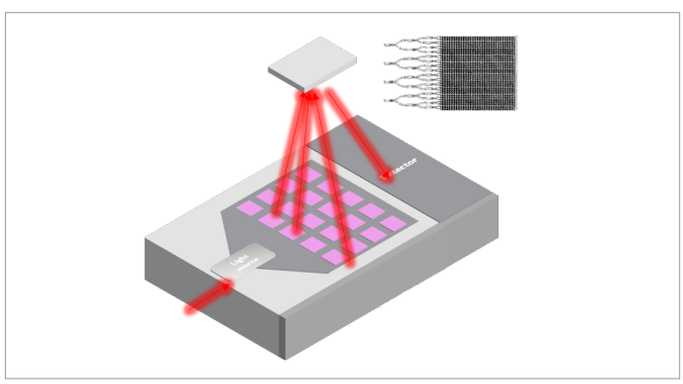
Conventional silicon photonic technologies are limited in the amount of power they have available to shine light off a beamforming chip. By combining imec's state-of-the-art industrial photonics technologies with new materials in an innovative stack, imec has created a high-resolution technology that can emit beams with powers up to three orders of magnitude higher than the milliwatt beams emitted by conventional silicon photonic chips. The result is a versatile optical beam forming platform that can be used to derive chips that exactly match the specifications of any given application, such as LiDAR, that requires a light scanner.

OPTICAL BEAM FORMING TECHNOLOGIES FOR LIDAR APPLICATIONS

LiDAR systems use (non-visible) light for detection and ranging in the same way radar systems use radio frequency electromagnetic waves. High-precision LIDAR can be used in autonomous vehicles to scan the environment and in diverse applications like atmospheric analysis and industrial mapping, which require systems that are highly reliable, compact and cost effective.

Conventional industry solutions use the scanning of MEMS mirrors, but industry is increasingly seeking solid-state solutions that implement beamforming in the optical domain for its cost, form factor and robustness. In this case, an array of light emitting/detecting structures, i.e., nanophotonics antennas, are individually modulated to form one precise, steerable beam. In its simple form, this light thrower/catcher is used to send and detect a light beam.

The travel time of this beam is a measure of the distance from a target and, in some cases, the target velocity.. This results in a more reliable system that is easy to assemble since it does not require mechanical parts.



KEY BENEFITS

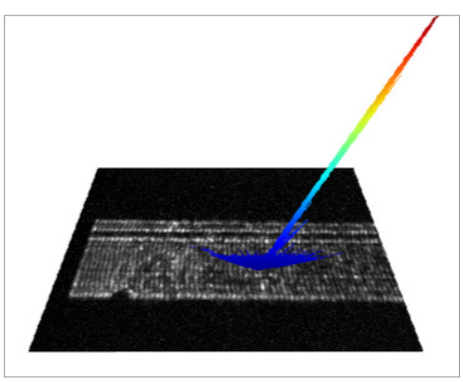
- **Full photonics solid-state solution:** a system that requires no mechanical parts, so it is much easier to assemble and has a higher reliability.
- **High-power and low-divergence beam:** imec's optical beam forming technologies allow injecting a high optical power (30W) with low beam divergence (<1°), suitable for long range measurements.
- **Highly integrable:** Due to the use of semiconductor technologies, the system can be fully integrated with all electronics into a System-on-Chip and/or a System-in-a-Package.
- **Affordable:** By using semiconductor technology, the cost is drastically reduced.
- **Dedicated development:** imec will manufacture a beamformer tailored to your needs. The travel time of this beam is a measure of the distance from a target and, in some cases, the target velocity.

APPLICATIONS

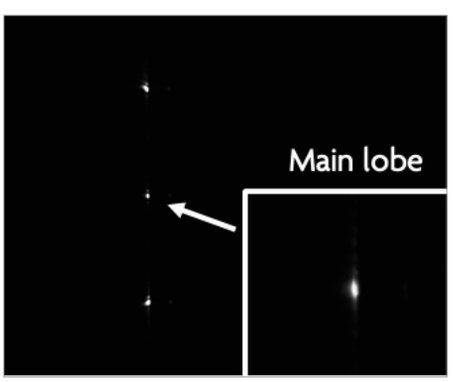
- Autonomous vehicles
- Aerial drones
- Automation of factory robots
- Service robots in hospitals and other customer oriented environments
- Assisted surgery
- Intelligent machine vision and robotics

ADVANCED DEVICES AND MATERIAL IN DEVELOPMENT

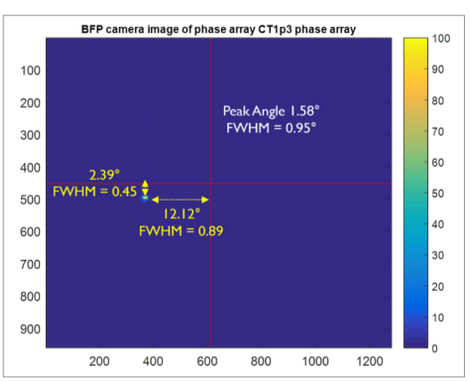
- High index materials for compact waveguides
- Frequency shifters
- On-chip phase interrogators
- Nano antennas
- Integrated detectors
- Phase shifters and optical switches
- Light in-coupling structures
- Integrated light sources
- Circulators
- Rotman Lenses



Near-field to far-field



Measured radiation pattern



SiN binary tree

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