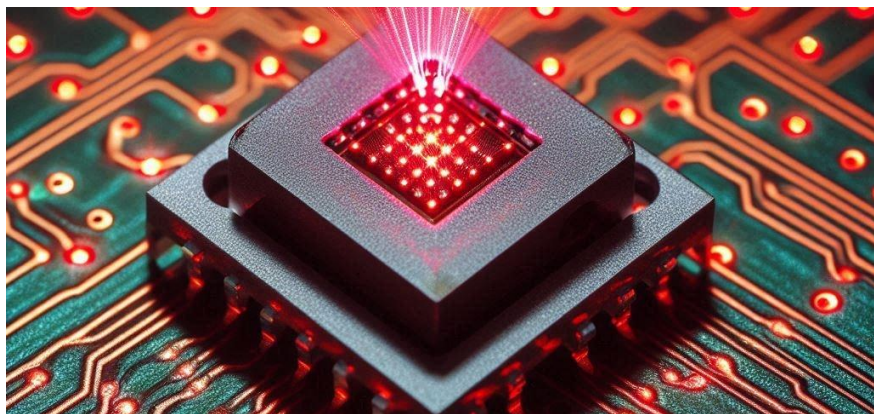


Technology Offer

CSIC/LR/026

Vertical emission Random Laser for signal processing and lighting applications



Semiconductor lasers with in-plane active layer are surface emitting devices by digging grooves into the semiconductor die. This allows to build single or multiple emitters with arbitrary shape on the same chip, with multiple frequency emission, low spatial coherence, and complex pattern beams.

Intellectual Property

PCT application

Stage of development

TRL 3-4

Intended Collaboration

Licensing and/or co-development

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Market need

In the lighting sector, it is currently necessary to choose between intensity and incoherence. Conventional lasers, both edge-emitting and vertical cavity surface-emitting, exhibit high spatial coherence, which produces artifacts when illuminating a scene. For applications such as microscopy lighting, it is essential that lasers be diffuse cavity lasers, which have very low spatial coherence.

In sectors where structured directional emission has applications, such structuring requires an additional procedure, whereas stochastic lasers provide it naturally.



Proposed solution

This technology leverages the discovery that diffusive surfaces enable resonant optical cavities eliminating the need for traditional mirrors in laser fabrication. Semiconductor lasers are developed with a conventional epitaxial structure, while defining the optical cavity by etching holes or grooves into the die. This design simultaneously enables optical feedback within the cavity and vertical light extraction.

Competitive advantages

- Industrial laser diode fabrication technology is mature.
- Manufacturing can be integrated on commercial wafers.
- Electrical pumping vs. optical pumping of most lasers simplifies and makes them portable.
- Potential for integrated networked lasers systems.
- Application in light sources with potential control on directionality, speckled spatial pattern, multi mode operation.