EUREKA EUROSTARS PROJECT
8598 HICOLA

PURE LIGHT, IT'S FANTASTIC

Fibre-optics are today's industrial workhorse delivering fast, reliable and virtually uninterrupted communications which keep people and machines working safely and productively, day and night. But to build better photonic devices like lasers for 'coherent communications' you need to teach light to behave itself, say partners in the HICOLA project.

Pure light is a virtue in the laser world. Being able to produce it in lab conditions is hard, but doing that repeatedly in harsh field conditions – like sensing dangerous gases or in space-based communications – is harder still.

But this is what Irish and Swiss partners in the Eurostars HICOLA project have been able to do by commercialising modern modulation formats fit for coherent communications of tomorrow.

In conventional optical communication systems, an electrical bit (data) stream modulates the phase of an optical carrier (the wave), which a receiver then converts into electrical signals with the help of a localised oscillator (laser). Photonics experts call that a 'coherent system'.

The project team has taken Eblana Photonics' laser diodes as the basis for developing industrial-proof optical lasers that hone in on the purist light (colour) in the spectrum, to deliver data across a narrower, cleaner stream or line-width. That means larger network capacity and less bit loss, which translates into more reliable data transmission from which important, even life-saving, decisions are made.

HICOLA's core activity was to model, characterise and ultimately improve the spectral purity of Eblana's proprietary laser technology. The solution needed to be simple, compact, robust and cheap to produce – a key factor in the competitive network communications sector.

The global fibre-optics market is worth an estimated USD 3.13 billion (EUR 2.94 billion) and projected to grow annually by 9.8%, reaching USD 5.00 billion (EUR 4.69) billion by 2021. Optical communications and coherent systems are a much smaller segment of that market, but HICOLA expects that to grow along similar lines.

"We are investing in R&D now so we can keep ahead of that trend," says Richard Phelan, Eblana Photonics' R&D director and HICOLA coordinator, and support from European programmes has played an important part in the SME's R&D mix.

Pleasant surprises

A second, somewhat unexpected, outcome of HICOLA's tests was to add another layer of frequency modulation capability in order to stabilise lasers, effectively tricking the light into behaving as it should under different conditions. The partners developed innovative techniques for this, which are currently being exploited in different application fields and presented at international conferences, such as CLEO Europe in Munich.

"When you modulate frequency, with the aim of boosting performance, the amplitude of the wave usually follows it automatically," says HICOLA partner Steve Lecomte of the Swiss Center for Electronics and Microtechnology (CSEM). "This can cause problems, but we found a surprisingly effective way to decouple frequency and amplitude, which is a significant result both for pure science and industrial applications," he adds.

The innovation is ideal for stabilising lasers used in metrology (scientific measurements), atomic clocks and gas sensing... but HICOLA predicts other completely novel applications could spring directly from this discovery.

Eblana Photonics is developing that innovation further with European Space Agency (ESA) support, and is keen to add it to the company's growing catalogue of photonic diodes and devices. "This innovation, which began at wavelengths typical of the telecommunications industry, is now finding a new and exciting home at lower wavelengths that will offer fundamental improvements to ESA's atomic clock programme," says Jim Somers, Eblana's CEO.

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Both partners have gained from the cross-border collaboration. Once the final testing is completed, Eblana expects these innovations to create a new category of products which it believes will add significantly to the company's bottom line and boost its reputation in the photonics marketplace. And CSEM gained additional expertise and tools which can be applied to new service lines.

This project has received funding from the Eurostars-2 joint programme with co-funding from the European Union Horizon 2020 research and innovation programme

MAIN PARTNER

Eblana Photonics, Ireland
www.visualcomponents.com
Richard.phelan@eblanaphotonics.com

OTHER PARTNERS

Swiss Center for Electronics and Microtechnology, Switzerland

TOTAL R&D INVESTMENT

€ 600 000

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COUNTRIES AND NATIONAL FUNDING BODIES INVOLVED

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