Technology increases the sensitivity of infrastructural sensors by more than 50 times

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Technology from the Public University of Navarre monitors the structural health of infrastructure (bridges, viaducts, oil pipelines, gas pipelines, etc.) and can be used in intensity-based optical sensors that modify the amount of light in the system in the presence of physical as well as chemical changes, as explained in Sergio Rota's Ph.D. thesis read at the Public University of Navarre (NUP/UPNA).

"Ever since fibre optics burst onto the scene in telecommunications, many developments based on its properties have emerged," said Sergio Rota. "So over the last few decades, the rapid evolution of fibre-optics-based systems and the appearance on the market of other devices has caused research in this field to advance considerably. Apart from the use of fibre optics in telecommunications, new applications have emerged, thus leading to new families of devices. Two of them of particular interest are fibre-optic lasers and fibre-optic sensors."

Both devices are based on fibre optics, a means of transmitting information via light. A laser is a device that emits light through optical amplification and by stimulating the emitting of electromagnetic radiation. Fibre-optic sensors are devices in which the parameter that is going to be measured (physical, chemical, biological or of another type) inserts modifications or modulations into one of the characteristics of the light in the optical system contained in it and allows it to be monitored.

Sergio Rota's research was based on the development of advanced fibre-

optic structures for lasers and sensors. "The aim was to improve the properties of both, and their monitoring systems, besides tackling the problems that they pose," said the author of this Ph.D. thesis, which received a "cum laude" distinction with international mention.

He developed a Rayleigh scattering distributed cavity laser (known as random lasers), the narrowest to date. Lasers of this type are characterised by the absence of reflective elements used in conventional lasers, thus improving the properties of the electromagnetic spectrum for monitoring sensors.

Furthermore he has improved some of the sensor monitoring elements in such a way that he has improved parameters such as their range (up to measurements of 250 km), sensitivity and stability.

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