INTERNAL CODE

020_FREQUENCIA

Control of optical frequency difference in Brillouin scattering-based applications

DESCRIPTION

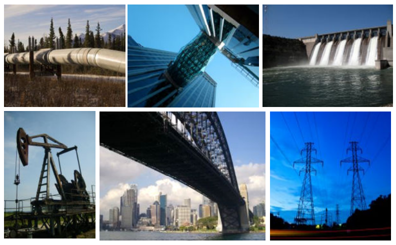

Figure 1. Applications where fiber optic distributed sensors based on stimulated Brillouin scattering are used.

Researchers from Unicamp have develop a new technique able to control de variation of optical frequency difference between the light emitted by two laser sources even in cases with unstable frequency emission. This technique uses the same SBS effect happening within the fiber, exploring both its attenuation and amplification phenomena, in order to infer the frequency difference, while an opto-electronic device controls the frequency emission by one of the laser sources.

This technology provides the fundamental subsystem to implement fiber optic distributed sensors using SBS. Distributed sensing is applied to measure mechanical strain, pressure or temperature distribution with high accuracy in industries such as energy, aerospace, oil, civic construction, process control and environmental monitoring.

MARKET OPPORTUNITIES

SBS is an optical effect that occurs when two optical fields generated by laser and an acoustic field interact altogether within the fiber, causing one of the fields to be attenuated while the other gets amplified. The amplification depends on frequency difference between the two lasers from which the physical profile suffered by the fiber can be measured. In order to control the frequency difference, only lasers with excellent stability can be used, which is not always possible, due to their high tech complexity and the expensive equipment associated with them. It also takes long time to measure such difference. It is thus needed a less complex technique able to work around unstable lasers but still find accuracy.

Fiber-optic sensors are increasingly used, particularly, in harsh environments, such as sensing in high-voltage and high-power machinery. Fast, frequent and accurate measurements of physical factors such as temperature, pressure or strain play a key role when it comes to ensuring the smooth operation of processes. Such sensors are used to monitor mechanical strain in buildings, civil structures, storing tanks, oil platforms, dams, ships, airplane wings, aerospace vehicles or long distance pipelines. They also monitor temperature distribution in electric generators, power transformers, reactor systems, furnaces, process control systems or fire detection systems. Currently, one of the main drivers for growth of fiber-optic sensors is buildings integrating them, known as “smart structures”.

DIFFERENTIALS

• Lower implementation cost. This system removes the use of RF components.

•It allows the use of laser sources with less stability of frequency emission.

•The stabilization of the frequency is achieved through the SBS effect instead of complex external devices and the opto-electronic component operates at lower frequencies. It is also faster than conventional techniques.

•The proposed techniques were tested and validated numerically and experimentally proving in all cases to be effective alternatives to control the frequency variations.

•This technology provides the fundamental subsystem that can be a potentially viable solution to implement in fiber optic sensors in comparison with current alternatives.

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PATENT STATUS

Patent requested at INPI

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