

NON-CONTACT TESTING OF CIVIL INFRASTRUCTURE USING SILICON PHOTONICS-BASED LASER DOPPLER VIBROMETERS (COLLABORATION WITH SCSDA, CHINA)

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Context

How to ensure the safety and durability of civil engineering infrastructure, such as bridges, tunnels, dams, etc) during its entire lifecycle is an important research topic. Most current structural health monitoring systems rely on the measurement of several fixed positions and require frequent sensor replacements, which provides limited information and leads to a high cost for long-term monitoring. This project targets to demonstrate a lightweight, portable, and low-cost laser Doppler vibrometry (LDV) technique for vibration measurements on civil engineering structures and materials (e.g. concrete). The LDV will be realized using a silicon-based photonic integrated circuit (PIC). Thanks to the lightweight feature of the PIC-LDVs, they can be carried by an unmanned aerial vehicle (UAV) to measure flexible locations and conventionally unreachable places, e.g. the middle of a long-span bridge.

In this research, the photonic research group at Ghent University will work together with the Smart City Sustainable Development Academy (SCSDA) in Chongqing, China, also known as the 'Bridge capital of China' due to its many long-span bridges across the Yangtze River and the Jialing River. The objective of the collaboration is to implement the PIC-LDV system for two important civil engineering applications: dynamic response testing, which is used to evaluate the overall performance of bridges, and non-contact damage detection, which is used to diagnose the detailed defects in materials. Several PIC-LDV systems will be built in this project and sent to the SCSDA, who will do the civil engineering testing using these LDV systems.

Job description

The candidate will be responsible for the research work on the optical part of the LDV, including the photonic integrated circuit (PIC) design, optical design, and LDV system testing.

The candidate will also work closely with the project partner, SCSDA, to understand the requirements of the civil engineering applications. The candidate will spend some time in SCSDA to get familiar with the civil-engineering applications using commercial LDVs.

The candidate will study the challenges of LDV in these civil engineering applications, especially the problems introduced by weak optical reflections and strong dynamic speckles, and provide corresponding solutions based on PIC-LDVs.

Profile

- You have a master's degree in photonics engineering, electronic/electrical engineering, or applied physics.
- Fluent in English and Chinese.

About the Photonics Research Group (PRG)

The Photonics Research Group (about 85 people) is associated with IMEC, and is part of the Department of Information Technology of Ghent University. The group is headed by Prof. R. Baets and has been active in photonics device research for many years. The other professors in the group are P. Bienstman, W. Bogaerts, B. Kuyken, N. Le Thomas, G. Morthier, G. Roelkens and D. Van Thourhout. The main research directions are silicon nanophotonics, heterogeneous integration, optical communication, photonic (bio)sensors and photonic integrated circuits for biomedical applications in the near-infrared and mid-infrared wavelength range. More in particular, the silicon nanophotonics work focuses on the design and fabrication of SOI-based photonic devices using standard lithographic techniques compatible with CMOS-processing.

The Photonics Research Group is partner of the Center for Nano- and Biophotonics of Ghent University and the group has been awarded four ERC Independent Researcher Starting Grants, one ERC Consolidator Grant and two ERC Advanced Investigator Grants.

Application

Use the online form: <http://photonics.intec.ugent.be/contact/vacancies/Application.htm>

More information

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