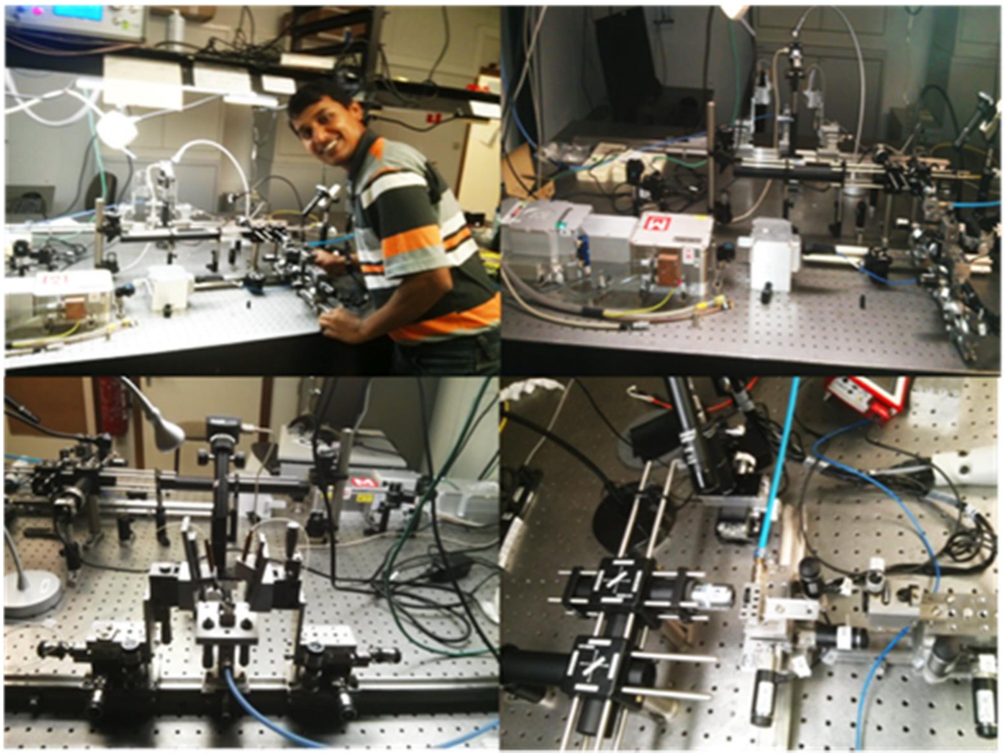
On-Chip Raman Spectroscopy | Ghent University of BELGIUM

The Photonics Research Group in the Department of Information and Technology at Ghent University is a pioneer in the field of silicon photonics and photonics integration for different applications ranging from ICT, sensing and life sciences. The group lead by Prof Roel Baets is currently using a SolsTiS-PSX for their work in the area of on-chip Raman spectroscopy for sensing and foolproof identification of biological entities for medical diagnostics.



Raman spectroscopy is a spectroscopic technique that provides information about the chemical bonds of the molecules (through Stokes and anti-Stokes radiation) and therefore provides a fingerprint and foolproof identification of the molecules. However, unlike conventional Raman system that uses microscopes, objectives and other bulk optics, PRG at Ghent University use integrated optics to do Raman spectroscopy. They make use of silicon-nitride (Si_3N_4) based waveguides and other integrated photonic elements fabricated using advanced CMOS processing techniques for doing on-chip Raman spectroscopy on the analytes placed in the close proximity to the waveguides.

They chose a SolsTiS-PSX for this application for the following reasons:

- Broad wavelength range and tunability (both coarse and fine) covering very near IR wavelengths (720-970 nm). This is essential for selecting an appropriate pump wavelength to remove fluorescence induced problems and for stronger Raman scattering.
- High power (> 2 W @ 785 nm & > 500 mW for entire bandwidth) that is required for Raman spectroscopy which is inherently a very weak process. Option of both free-space and fibre coupling (through additional fibre coupling unit with > 75% coupling efficiency) schemes to couple light into the waveguide.

- Remote interfacing that enables easy control of the laser without manual intervention.
- Once installed, it is a sturdy, alignment-free design and occupies very less space. It also has very low rms amplitude noise, narrow linewidth and high rejection ratio.

The Group uses both horizontal (butt coupling using lensed fibre and objective lenses) and vertical (through normal single mode fibre and on-chip grating couplers) coupling schemes to couple light in and out of the photonic waveguides. Furthermore, they have also implemented their own Python-based framework for remote interfacing of the SolsTiS laser for performing various tasks such as recoding output, tuning the wavelength and in-situ plotting of results. In order to do this, the TCP/IP protocols were provided by M Squared Lasers which were then implemented within the Python framework at the PRG labs for remote interfacing and controlling of the laser with different components such as power-meters, detectors, OSAs etc.

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