

# Post doctoral position

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## Non-linear optics in Si photonics devices at near-infrared and mid-infrared wavelength range.

Silicon photonics shows a great potential for nonlinear applications in the near- and mid-infrared (IR) wavelength ranges, exhibiting strong nonlinearities in bulk materials, high index contrast, CMOS compatibility, and cost-effectiveness.

The objective of the post-doctoral position is to explore non-linear optics effects in a variety of devices, based on the different platforms available within silicon photonics, namely SOL, SiGe as well as hybrid platforms based on different materials integrated on Si photonics (chalcogenide, Erbium, CNT,...).

The candidate will build on a unique experimental set-up developed within the group to explore non-linear effects in a wide wavelength range from visible to mid-infrared, covering telecom, sensing and spectroscopic applications. Targeted objectives are on-chip wideband sources (based on supercontinuum generation, or frequency comb) and frequency generation such as second harmonic generation or four-wave mixing.

The research activities will include the development of a non-linear optical set-up, the characterization of various non-linear photonic devices, and will also contribute to the theoretical studies, optical simulations and result analysis. The post-doctoral researcher is expected to be actively involved in the different research activities of the group, collaborating with PhD students, postdocs and researchers of different research backgrounds and nationalities.

### VALUED QUALITIES IN THE STUDENT

- Curiosity for novel research experiences and fields.
- Creativity and pro-activity in the search for innovative solutions and approaches.
- Attractivity in experiments and simulations.
- Capability to communicate and share results in a multidisciplinary and multi-nationality environment.

### BIBLIOGRAPHY RELATED TO THE TOPIC

- M. Berciano et al., Fast linear electro-optic effect in a centro-symmetric semiconductor, Nature Communications Physics, 1(1) (2018).
- J.M. Ramirez, et al, Ge-rich graded-index Si<sub>1-x</sub>Ge<sub>x</sub> waveguides with broadband tight mode confinement and flat anomalous dispersion for nonlinear mid-infrared photonics, Optics Express 25 (6) 6561 (2017)
- S. Serna et al., Nonlinear optical properties of integrated GeSbS chalcogenide waveguides, Photon. Res. 6(5), B37 (2018). <https://doi.org/10.1364/PRJ.6.000B37>
- Zhang L, Agarwal AM, Kimerling LC, Michel J. Nonlinear group IV photonics based on silicon and germanium: from near-infrared to mid-infrared. Nanophotonics 2014;3:247–68.