Phonon storage of optical pulses in silicon phoXonic chips

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Motivation
- TAILPHOX : TAILoring photon-phonon interaction in silicon PHOXonic (X=t,n) crystals
- The tight confinement of light and sound in such a small region, as well as their slow group velocities will enhance strongly the opto-acoustic interaction.
- Develop novel high-performance structures and devices based on phononic and photonic crystals.
- Nanosecond delays could be realized in distances on the order of millimetres by converting optical data pulses into long-lived acoustic excitation.

Photonic waveguide
- Photonic band structure of a defect-based phoxonic crystal waveguide around 5 GHz.
  - The complete phononic band gap appears in white
  - One acoustic mode (continuous line) with flat dispersion, appear at 5 GHz for all axial wavevectors.
  - Phononic and photonic Bloch modes are computed according to the super-cell technique.

Phononic waveguide
- Phonon storage of optical pulses in silicon phoXonic chips
- We predict simultaneously slow light (c/25) and slow sound (v/30) in silicon phoxonic waveguide.

Conclusion
The long term vision of the TAILPHOX project would permit the realization of high performance optical devices and applications by a phoXonic design that optimizes the influence of acoustic waves on the optical functionality.
- A simultaneously phononic and photonic band gap in silicon waveguide.
- Joint confinement of light and elastic waves with low group velocities is obtained.
- New direction for the development of photonic devices with ICT (Information and Communications Technologies) applications like optical storage or phoxonic sensor.