

# Superlattices: nanomaterials for photonics and optical spectroscopy

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Superlattices are one of the best materials to study and control quantum transport and optical properties at the nanoscale [1-3]. In this paper, we start with a hybrid approach, combining nonequilibrium Green's functions with solutions of the Boltzmann equation to describe control of giant THz nonlinearities with excellent agreement with experiments [3-10].

The resulting superlattice multipliers are applied to the detection of nitrides in the urine of cancer patients, outlining a diagnostics technique with strong potential to monitor toxic effects of chemotherapy [11].

In the second part of the talk, superlattice waveguides are used to demonstrate, theoretically and experimentally, photonic functionalities such as rotators and splitters in a silicon on insulator platform [12-14].

Possible projects for PhD students with full Fellowship at KU will be discussed. See a video of KU at Ref. [15].

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