

High-speed modulators and photodetectors based on Ge/SiGe Quantum Wells.

D. Marris-Morini¹, V. Vakarín¹, P. Chaisakul^{1,3}, J. Frigerio², M. Rahman¹, J. M. Ramírez¹, A. Ballabio², D. Chrastina², X. Le Roux¹, L. Vivien¹, G. Isella²,

¹ Institut d'Electronique Fondamentale, Univ. Paris-Sud, CNRS UMR 8622, Orsay, France

² L-NESS, Politecnico di Milano, Polo di Como, Italy

³ Department of Materials Engineering, The University of Tokyo, Japan

delphine.morini@u-psud.fr

Recent advances in the theoretical and experimental studies of Ge/SiGe quantum wells structures will be presented with a focus on optical telecommunication applications. Firstly, high-speed stand-alone Ge/SiGe QW electro-absorption modulators and photodetectors will be reported. It will be followed by the presentation of different methods for engineering Ge/SiGe QW to tune the operating wavelength to 1.3 μm . Then the demonstration of a strong electro-refraction Ge/SiGe QW will be reported. This effect could be used to achieve optical modulation but requires the embedding of the QWs in a Mach-Zehnder interferometer. Finally it will be shown that these active devices can be combined with advanced passive structures using Ge-rich SiGe virtual substrate on graded buffer as a waveguide.