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New techniques for tuneable mid infrared quantum cascade lasers

Prof. Charles Ironside

Electronics and Nanoscale Engineering
School of Engineering, University of Glasgow

Friday, 2 November 2012 @ 3.30 pm

Venue: Billings Room 3.04, 3rd floor, Electrical & Electronic Engineering Building
The University of Western Australia, Crawley

This seminar is open to the public and admission is free to all IEEE members and non members

Abstract

Quantum cascade lasers are compact, robust and reliable mid-infrared semiconductor lasers based on intersubband transitions in quantum wells. They are often employed as sources of mid-infrared light (wavelengths between 3000-5000nm) in systems that sense gases by means of measuring their optical absorption, for example gases such as hydrocarbons (methane and ethane), CO2 and CO have strong mid-infrared absorption lines. For these applications, quantum cascade lasers need to emit in a narrow and tuneable range of wavelengths. This talk describes how monolithic chip designs can give tuneable, near single wavelength, output. We will discuss, grating designs, coupled ring lasers and a novel polarisation control method that can be used to fabricate an on-chip, integrated birefringent filter for tuning the quantum cascade lasers. We will also discuss how these lasers are employed to detect gases.

About the speaker

Charlie Ironside has been professor of quantum electronics in the school of engineering, university of Glasgow since 1998. He works on semiconductor optoelectronics and has published over 250 papers in this field. He has undertaken research on chip design for quantum cascade lasers since early in their inception. His research group has developed quantum cascade laser chips with photonic crystal band gaps, unidirectional ring lasers, coupled dual ring lasers, lateral diffraction gratings and polarisation control. Some of this work has been commercialised by start-up companies (Cascade Technologies and Compound Semiconductor Technologies) and has found its way into commercially available systems for infrared gas spectroscopy. Applications of these systems include, defence, security, environmental monitoring, processes control and carbon capture and storage. For more details see: http://userweb.eng.gla.ac.uk/charles.ironside/