Applied Optics group
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The University of Nottingham

The Electrical Systems & Optics Research Division invites you to:

Applied Optics Group Lunchtime Seminar

"Terahertz phonon lasers: a big sound from nanostructures"

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Abstract: In this talk I will describe our work on building what we believe to be the world's first terahertz acoustic phonon laser, or saser (for: sound amplification by the stimulated emission of radiation) device.

This year is the fiftieth anniversary of the invention of the laser by Theodore Maiman. It has long been known that the same basic physical principles of amplification by stimulated emission apply to phonons as well as photons, but a THz saser has proved elusive, mainly due to relatively short lifetimes of the THz phonons. However, by exploiting recent advances in the fabrication of semiconductor nanostructures, it has been possible to make THz acoustic cavities with phonon lifetimes of about one nanosecond.

I will describe the main elements, gain medium and acoustic cavity, of a prototype saser device based on semiconductor superlattices, and present the experimental evidence of saser action: a pumping threshold and acoustic spectral line narrowing [1]. I will also discuss potential applications of sasers: as a source of spectrally pure sound having nanometre wavelengths, a Terahertz sound laser could find many applications including in probing and imaging of nanostructures and high-speed "clocking" of electronic devices.

[1] R Beardsley et al, *Phys. Rev. Lett.*, **104**, 085501 (2010).

1pm Wednesday 17 March 2010
2nd Floor Lecture Theatre
Tower Building. All welcome

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