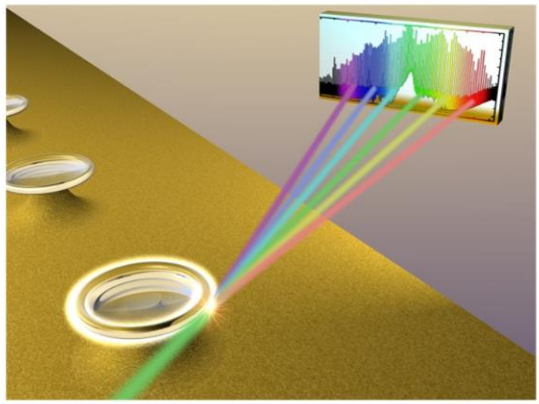
19/10/2015

NPL National Physical Laboratory | QMI Quantum Metrology Institute

Doctoral Position - Ultra-High-Q Microresonators for Optical Frequency Comb Generation

Ultra-High-Q microresonators allow us to confine extremely high levels of optical power into tiny micron-scale volumes. This enables the observation of nonlinear optical effects at extremely low threshold powers, making microresonators ideal components for future generations of integrated photonic circuits and for optical computing.



A chip-based ultra-high-Q microresonator converts a single-frequency laser into an optical frequency comb via the Kerr nonlinearity.

One key application that utilises nonlinear optics in microresonators is the generation of optical frequency combs [1]. Optical frequency combs have become ubiquitous tools for spectroscopy, precision metrology and optical clocks and their discovery was rewarded with the Nobel Prize in 2005. Microresonators have recently been shown to be promising candidates for shrinking optical frequency comb generators into chip-based devices for out-of-the-lab use [2]. However, the underlying physics of optical comb generation in microresonators is not fully understood and the physical principles are currently under investigation.

There are opportunities for two doctoral students to join a recently established research team at the National Physical Laboratory (NPL) to work on microresonator-based frequency comb generation. Several research projects are available both on the applied side of frequency comb generation in microresonators as well as on the fundamental research side with the goal of understanding the physics of the underlying comb generation process. NPL provides an ideal environment for these projects with an existing infrastructure of optical atomic clocks and conventional frequency combs.

- **Research on Microresonator-based Optical Frequency Combs**
- **Doctoral degree from Oxford or Heriot-Watt**
- **Located in Teddington, 40 min by train from central London**
- **Funding includes university fees and a competitive stipend**

For further information please contact:
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[1] Del'Haye et.al, Optical frequency comb generation from a monolithic microresonator **Nature** 450, 1214-1217 (2007)
[2] Kippenberg, Holzwarth, Diddams, Microresonator-Based Optical Frequency Combs **Science** 332, 555-559, (2011)

"Never measure anything but frequency!" - Arthur Schawlow