nanoX invited scientist

Anna Swan

Position Visiting Scientist

Affiliation Photonics Center, Boston University
8 St Mary's St, Boston MA 02139
USA

Host lab at NanoX CEMES Team M3

NanoX contact Wolgang Bacsa, wolfgang.bacsa@cemes.fr

Dates of stay 2 months. Early April- Early June

Join a photo

Brief Biodata

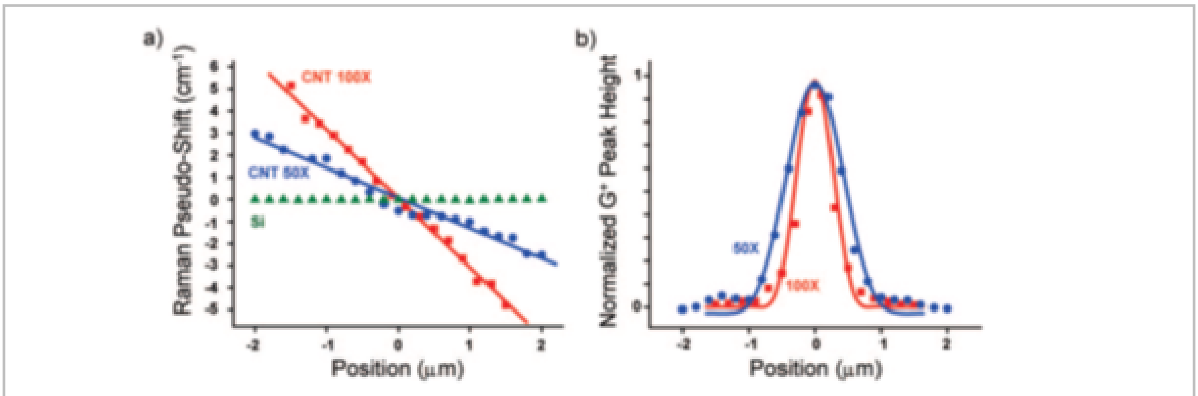
Professor Swan is a faculty member in the Electrical and Computer Engineering Department (ECE) at Boston University (BU), Boston. She has affiliated appointments in the Physics Department and is a member of the BU Material Science and Engineering Division, the BU Photonics Center, and BUnano. Education: MA in Physics Engineering from Chalmers University, Physics PhD at Boston University. Her dissertation work was awarded the Nottingham Prize and the Mortom Traum Award. Before joining ECE, she had a Wigner fellowship at Oak Ridge National Lab. Current work is on 2D quantum materials, particularly manipulating quasiparticles with local strain fields. This may result in single photon emission, or electron hole liquids. During her sabbatical, she is working with Prof Gundogdu, NCSU, on macroscopic coherence: superfluorescence in lead-halide perovskites at RT.

Research project during the visit at nanoX

Consequences of the finite size effect of the optical focal spot for nanotechnology

In previous work, we have observed that, unlike macroscopic emitters, the spectroscopic signature from a nanoscale sample depends on the exact location of the sample within the optical focal spot. Light emitted off the optical axis forms a small angle with respect to the optical axis. The angular offset is carried through the entire optical system and results in an offset on the spectrometer detector. Therefore, the true wavelength is now shifted by the offset, which results in an apparent spectral shift. Spectral shift also depends on the focusing condition; under-focusing reduces and over-focusing increases the apparent spectral shift. For a macroscopic material, the off-axis effect only boadens the spectral feature, but for a nanoscale object such a quantum dot, nanowire or nanotube, the non-central placement reslts in a false spectral shift.
The aim of this project is to make use of these false spectral shifts in order to increase optical resolution of optical microscopy and micro-spectroscopy beyonds the classical optical resolution. We plan to model the effect combined with experimental measurements in Prof Bacsa's lab. We propose to explore this ubiquitous effect at much higher accuracy using elastically scattered light (Rayleigh scattering).

If relevant, add a figure



Aparent Raman shift of G band (a) and intensity (b) of isolated nanotube as a function of distance to optical axis.