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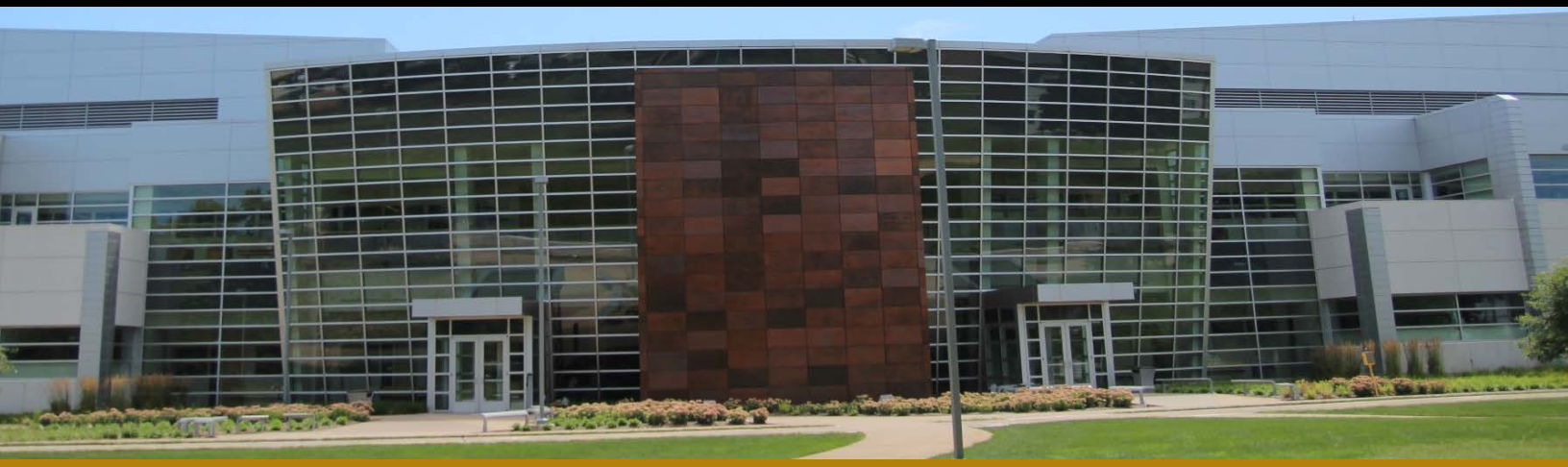

Birck Nanotechnology Center

Reconstructing Nonlinearity with Intermodulation Spectroscopy

David Haviland

Professor of Nanostructure Physics, KTH Stockhom Sweden

Tuesday, February 26, 2019
11:00am – 12:00pm, BRK 1001

Bio: David Haviland did his PhD at the University of Minnesota on the superconductor-to-insulator quantum phase transition. His post doctoral research at Chalmers in Göteborg, Sweden, studied Coulomb blockade in superconducting tunnel junction circuits. He is currently a professor of Nanostructure Physics at KTH in Stockholm, Sweden, where he leads a research group working on nonlinear dynamics in atomic force microscopy (AFM) and superconducting circuits. His current research focuses on quantum limited force measurement, nano-scale rheology and viscoelastic impact with dynamic AFM. He is a member of the Swedish Royal Acadamy of Sciences.

Abstract: This talk describes an efficient multifrequency method of probing nonlinear response, giving several examples of its application in the field of scanning probe microscopy. High Q resonators are frequently employed in physics to make sensitive measurements, where the system of interest perturbs the dynamics of the resonator. Often this perturbation is nonlinear and when driven at two our more frequencies, the resonator responds with a frequency-comb of intermodulation products (frequency mixing products). With an appropriate drive scheme, many high-order intermodulation products can be measured near resonance with good signal-to-noise ratio. A remarkably simple method exists for reconstructing the nonlinear perturbation from a phase-coherent measurement of the intermodulation products. The frequencies must be carefully tuned, or appropriately chosen such all tones in the comb have a definite phase relation to one reference oscillation, thus enabling a multifrequency lockin measurement.

Host: Professor Arvind Raman

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