



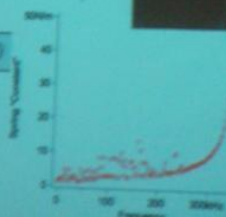


Functional Mapping – PFM and ESM

Beware of No Mode's Land

Measurement	Worry about mode shape???
Force Curves (<50Hz)	No
Force Curves (>50Hz)	Yes
Force Modulation	Yes*
Contact Resonance	Yes
PFM/ESM	Yes*
Tapping - including Loss Tangent and AMFM	No
Indenting	No(?)

Multifrequency Madrid



John Sader
U. Melbourne
Caltech

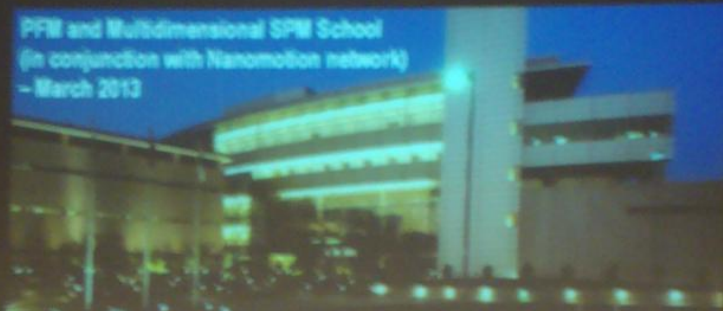


Ryan Wagner and Arvind
Raman, Purdue

See Ryan's Contact
Resonance Work –
Poster #85



PFM and Multidimensional SPM School
(in conjunction with Nanomotion network)
– March 2013



Interested in using facilities at the Center for
Nanophase Materials Sciences at ORNL?

Sergei V. Kalinin, sergei2@ornl.gov

Talking about harmonics

Wanted or not, harmonics appear everywhere:

- laser spot on position sensor (PSD)
- electronic amplifiers (excitation, amps for PSD, ...)
- nonlinear mechanical behavior of the lever (!)
- tip-sample interaction

???

- Can we find an analytical expression for the LIA images?
- Is it possible to distinguish between nonlinear artifacts and physical relevant signals, i.e. nonlinearity?



Theory to understand the
image generating mechanism



Adapted from: G. Binnig et al., "SPM: Scanning Probe Microscopy and Spectroscopy", Springer, 1992.











