Christian-Albrechts-Universität zu Kiel

Controlling structure and dynamics of complex plasmas

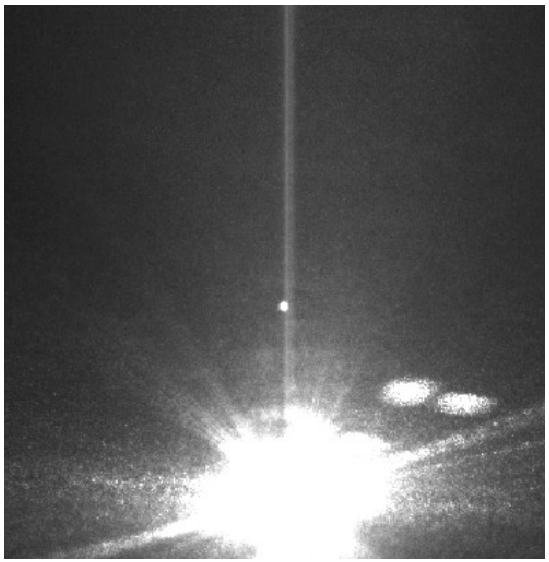
TR 24 complex plasmas

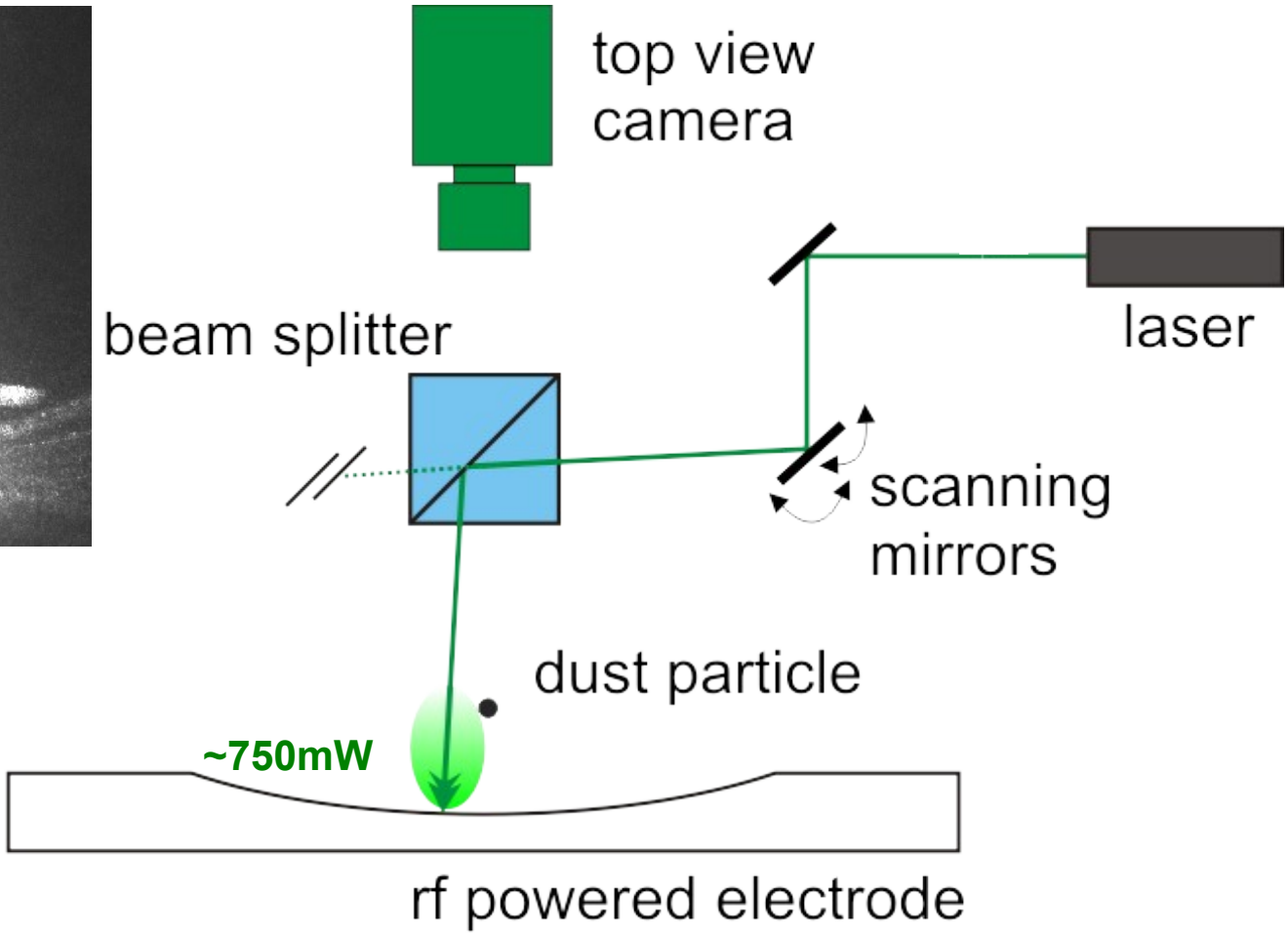
project A3b

Jan Schablinski, Frank Wieben and Dietmar Block

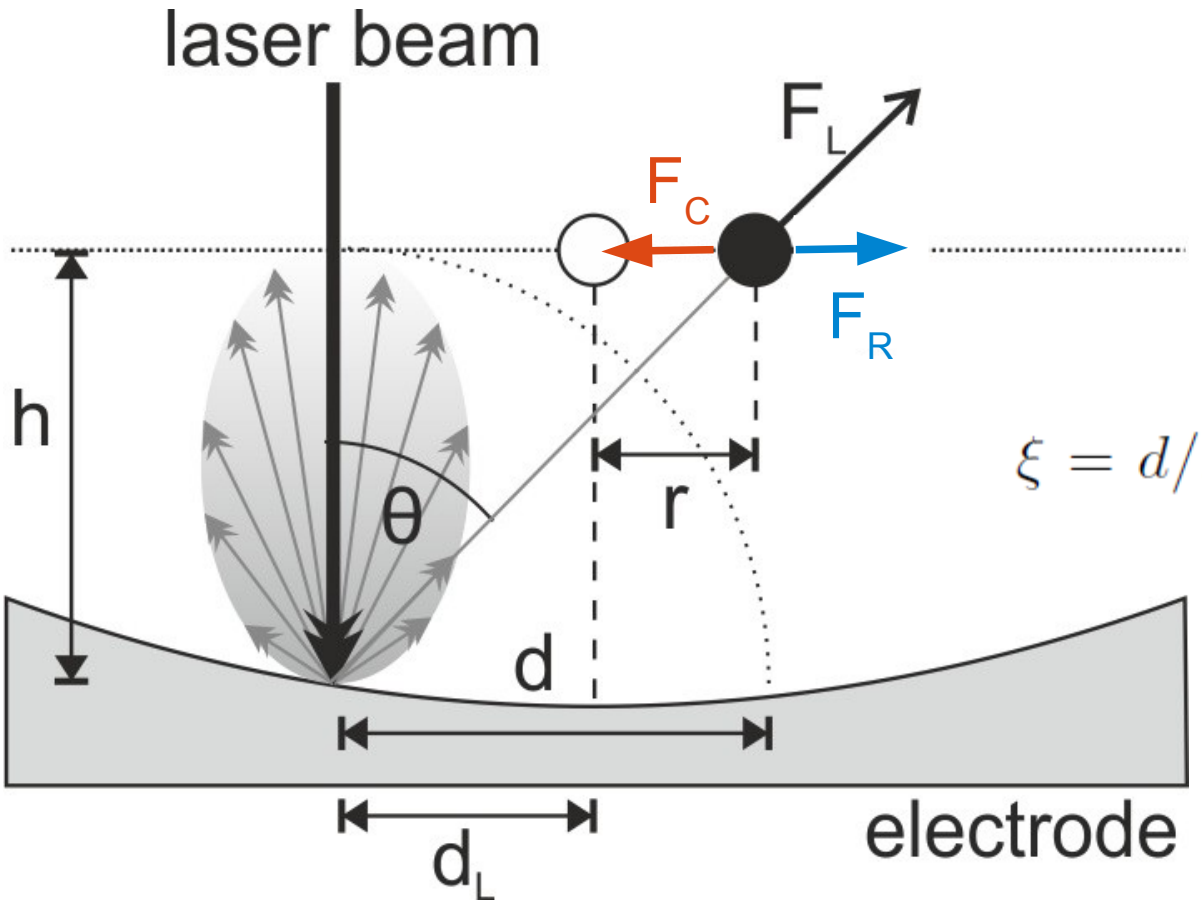
Workshop on the Physics of Dusty Plasmas
Auburn, May 2015

Experiment 1: Force on a single particle





Force on a single particle



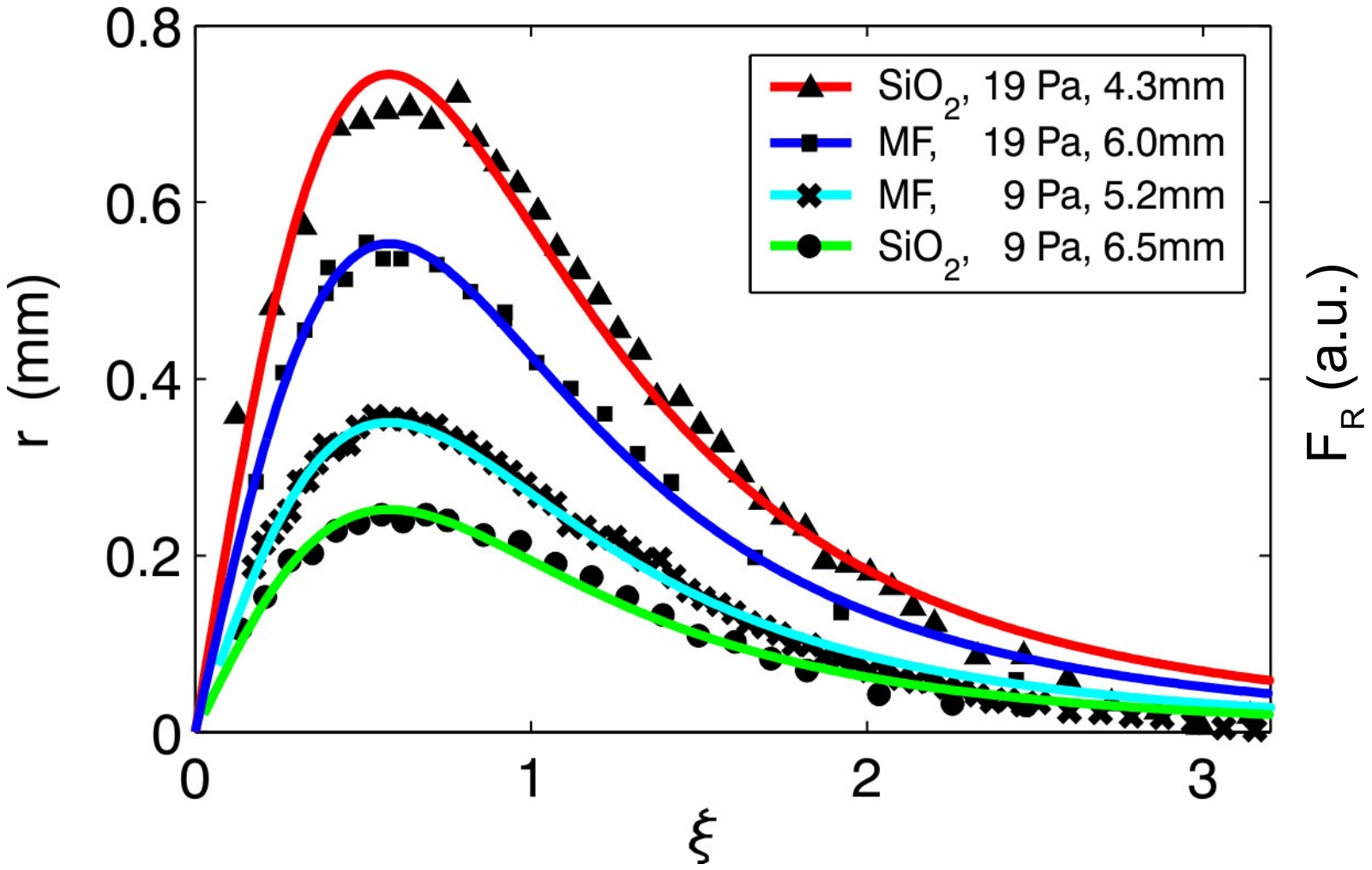
$$\xi = d/h = \tan(\Theta)$$

parabolic confinement

$$F_C = kr = c_r \frac{1}{h^2} \frac{\xi}{(1+\xi^2)^2}$$

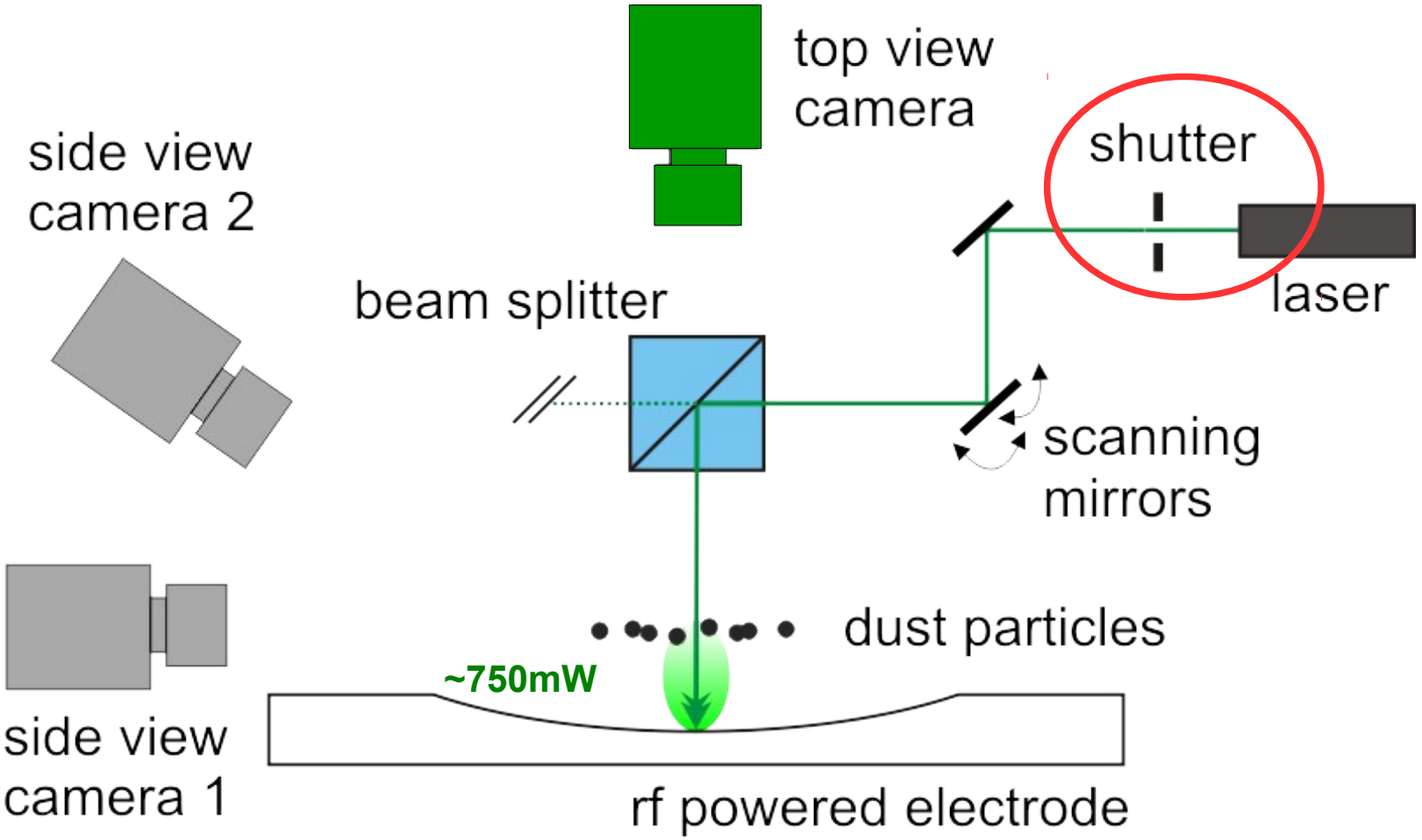
radiation pressure

Force measurement

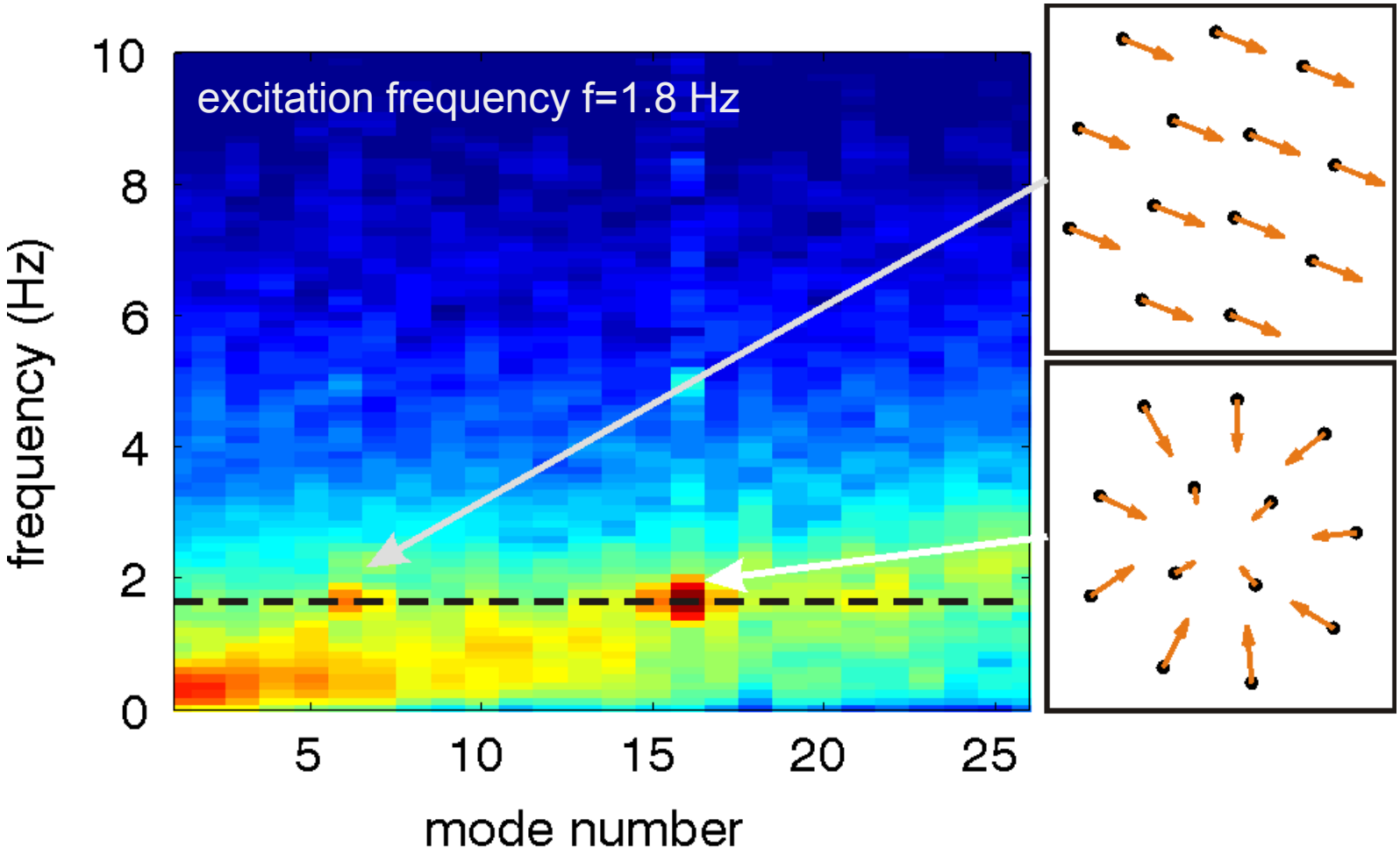


$$\xi = d/h = \tan(\Theta)$$

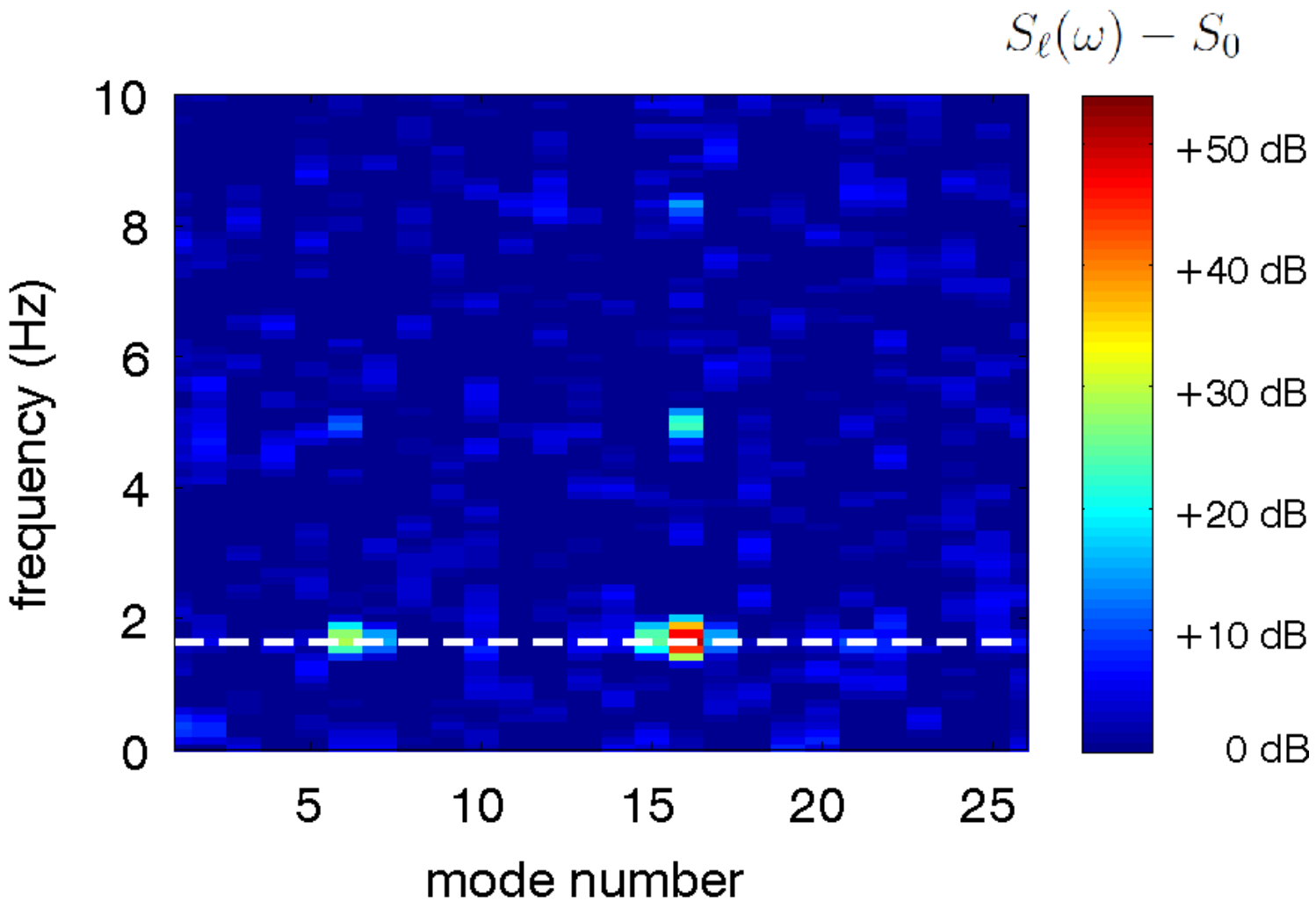
Experiment 2: Mode excitation



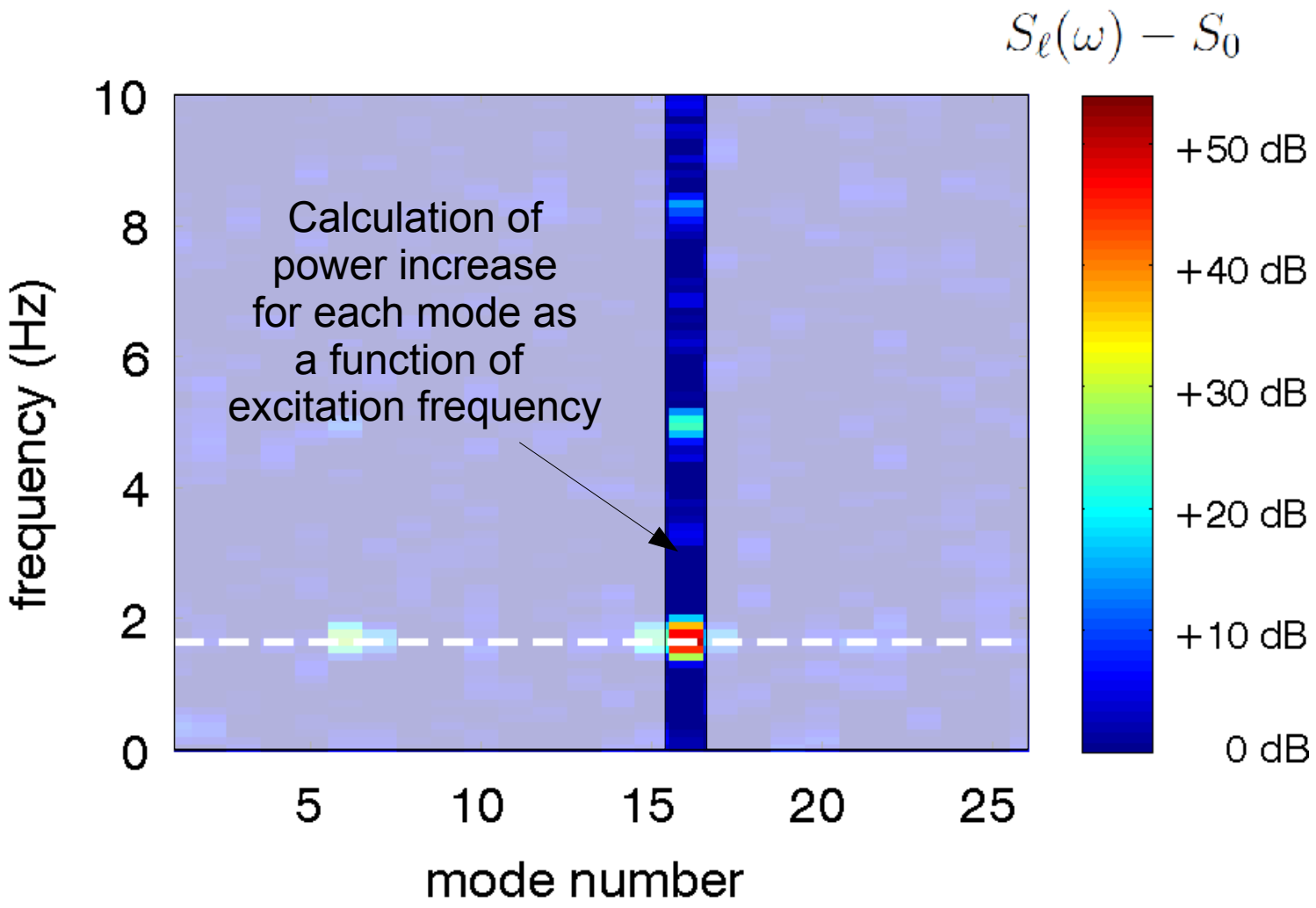
Normal mode spectrum



Difference to undriven system

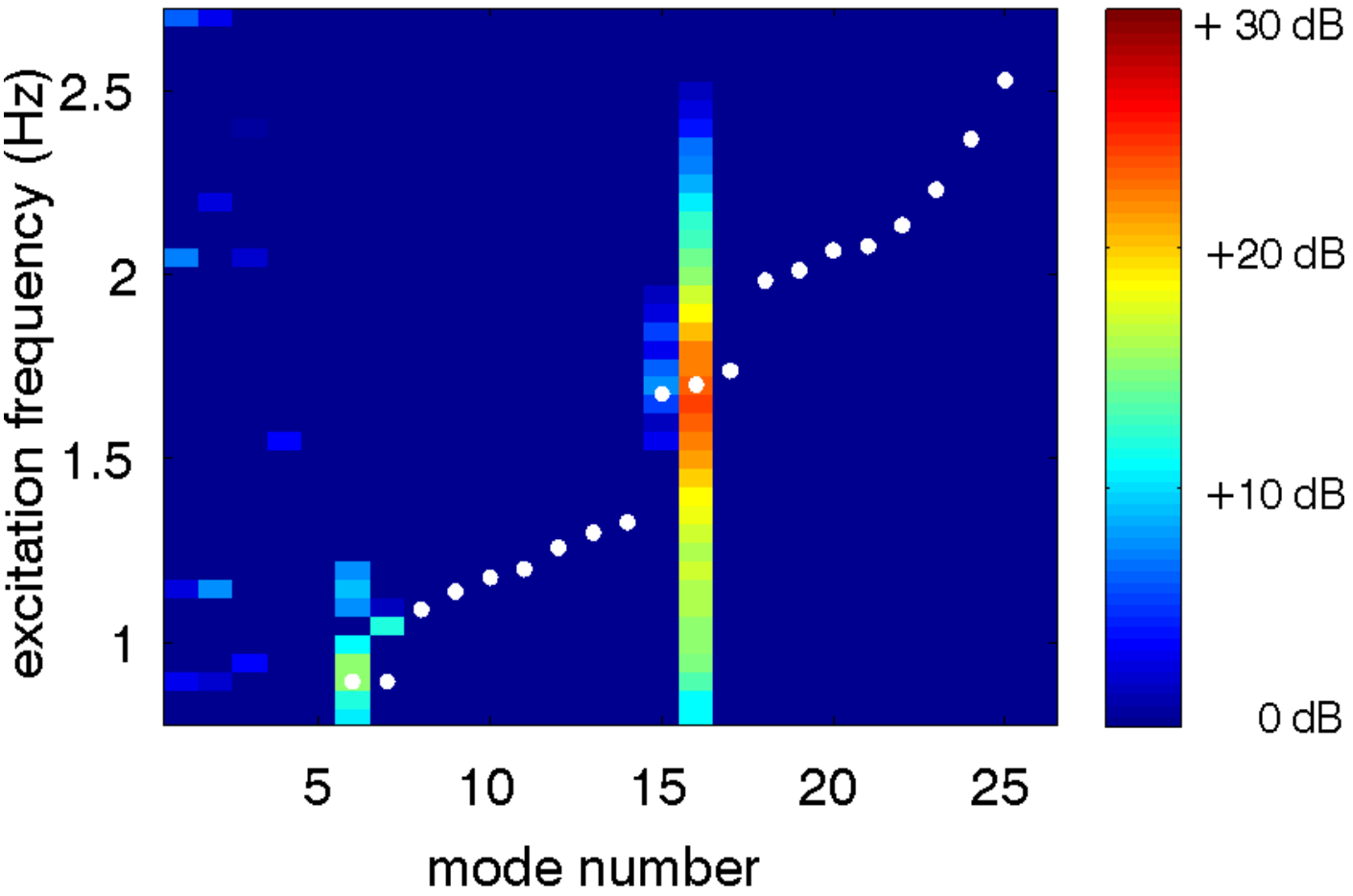


Difference to undriven system

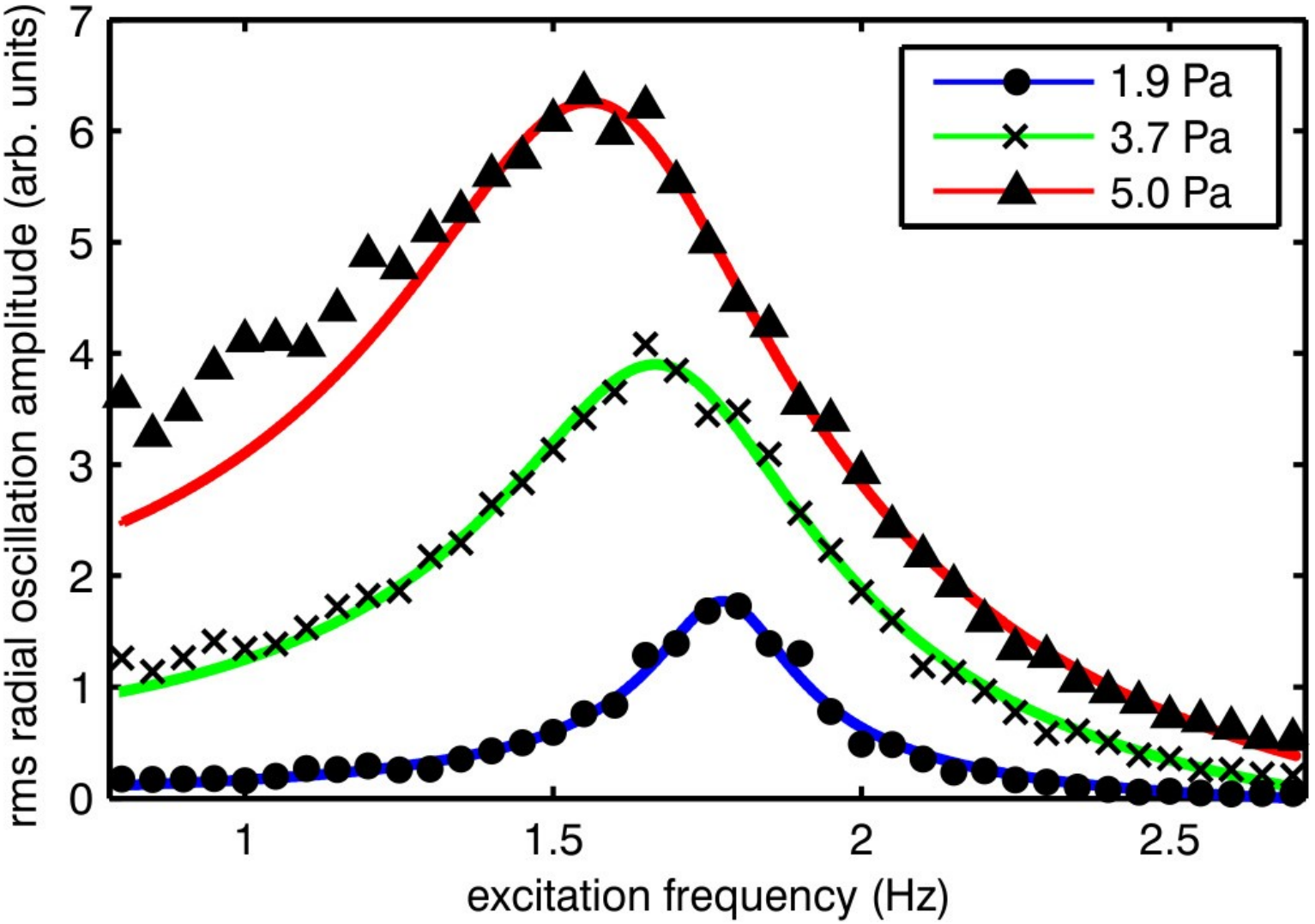


Mode excitation of a small cluster

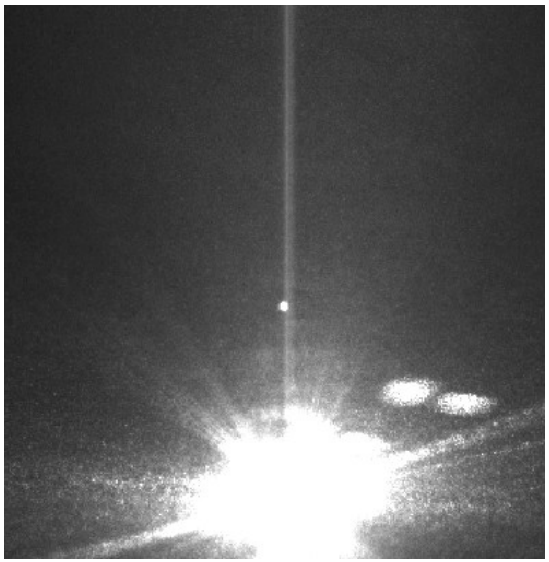
$$\int_0^\infty (S_\ell(\omega) - S_0)\mathrm{d}\omega$$

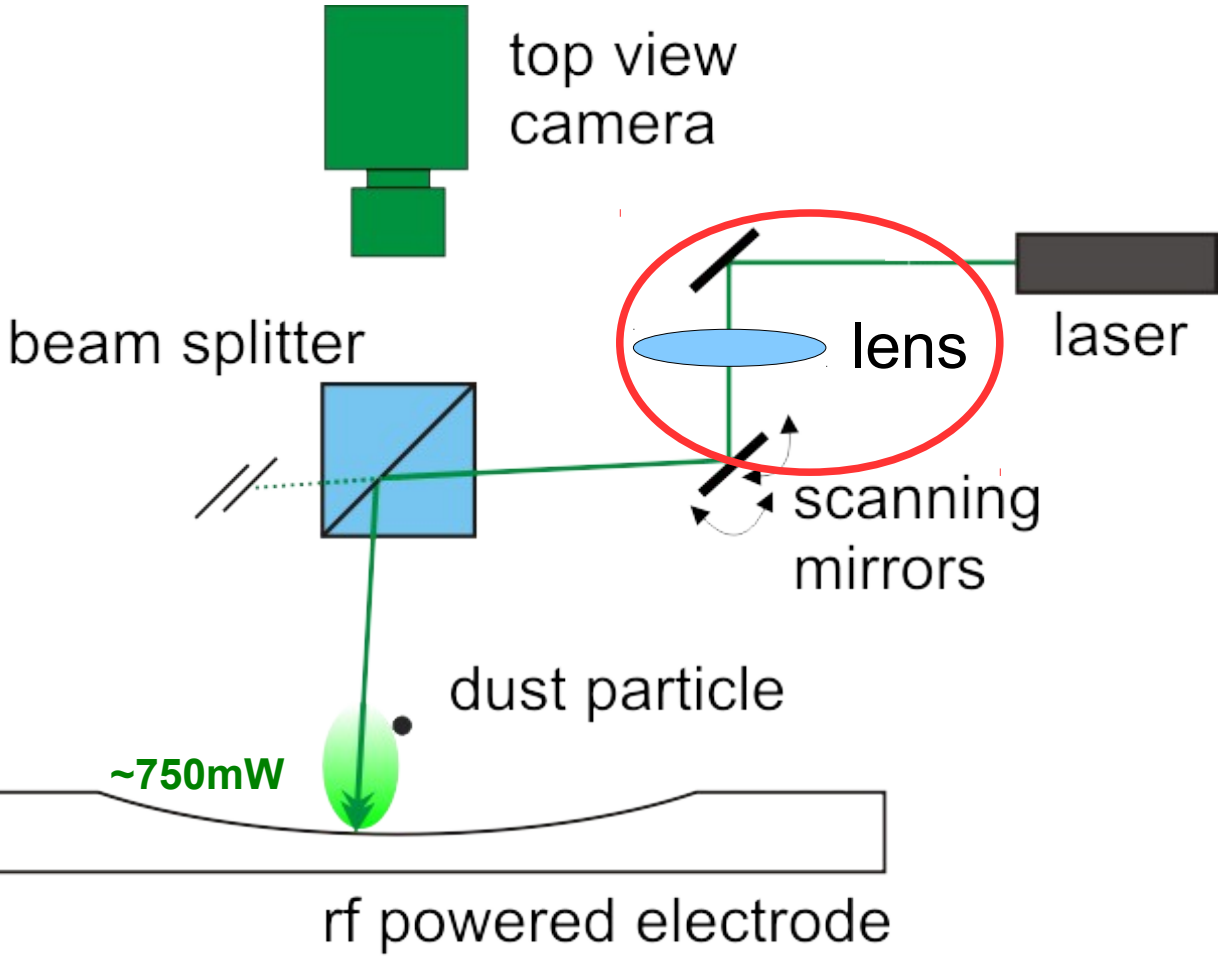


Driven harmonic oscillator

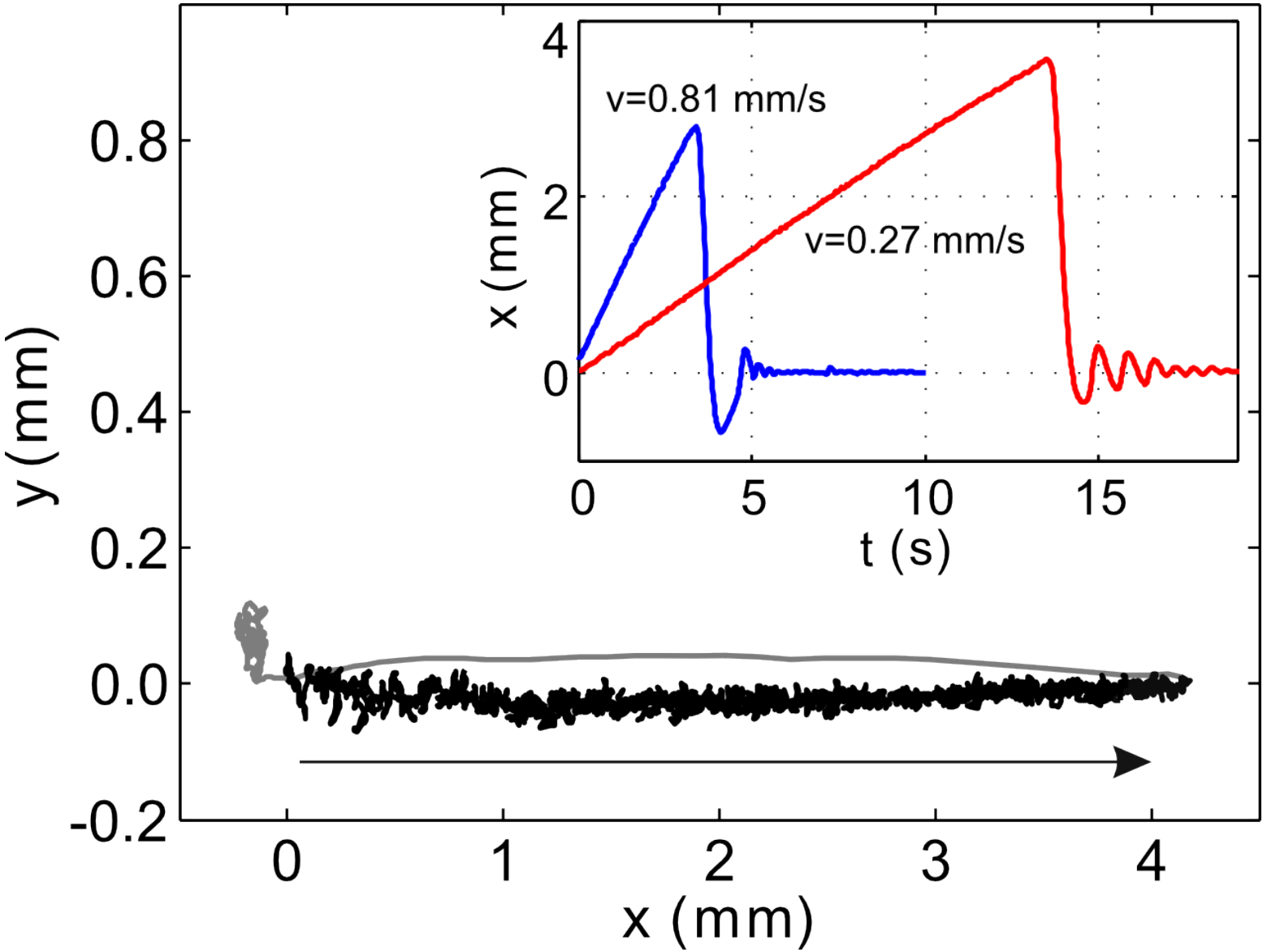


Experiment 3: An optical trap for particles

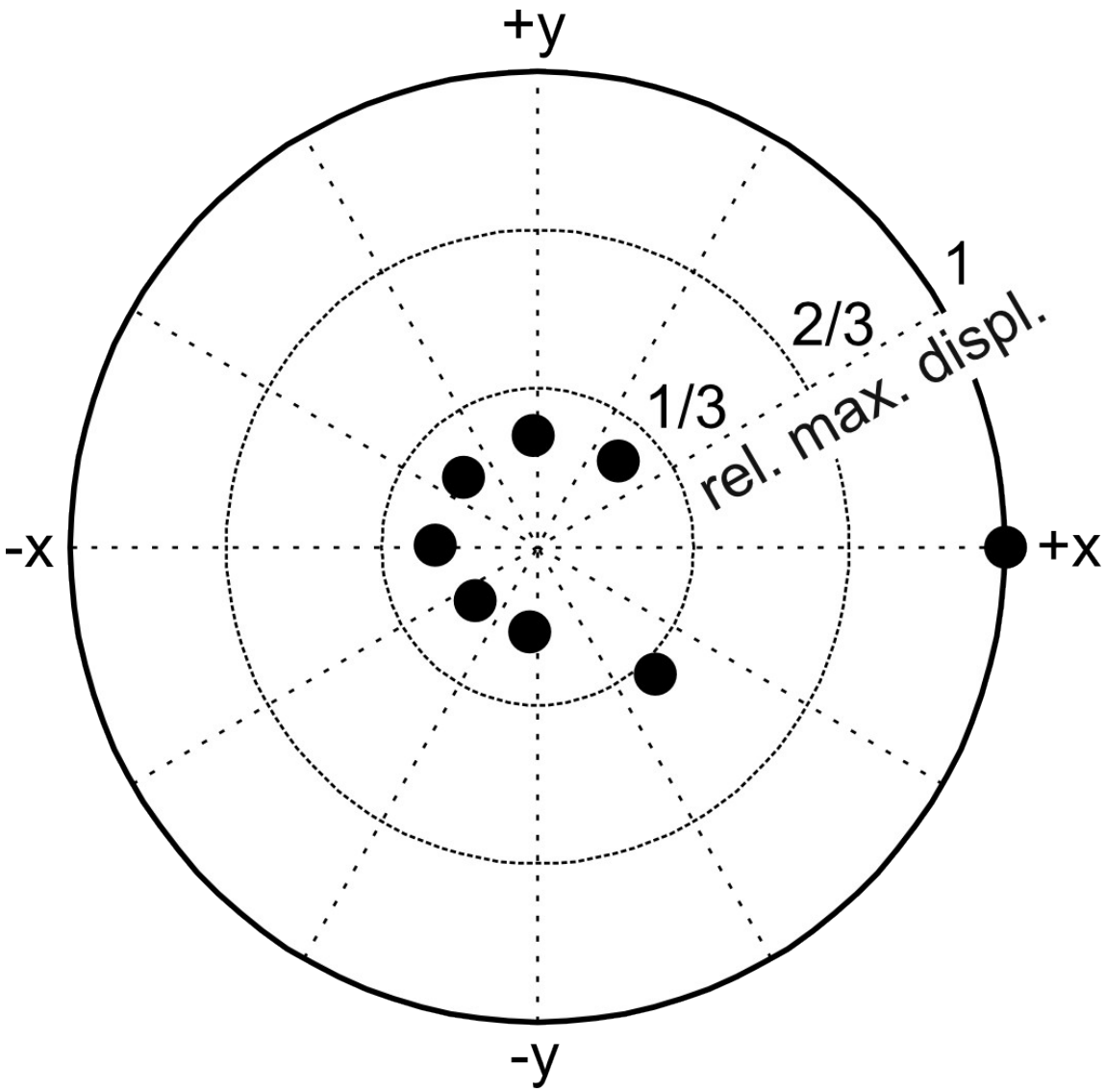




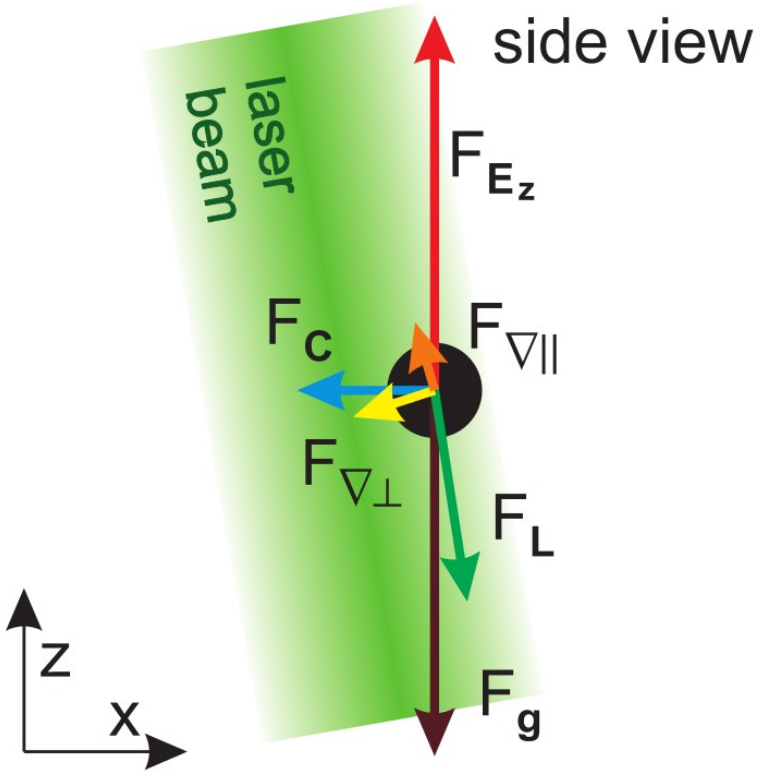
Moving a trapped particle

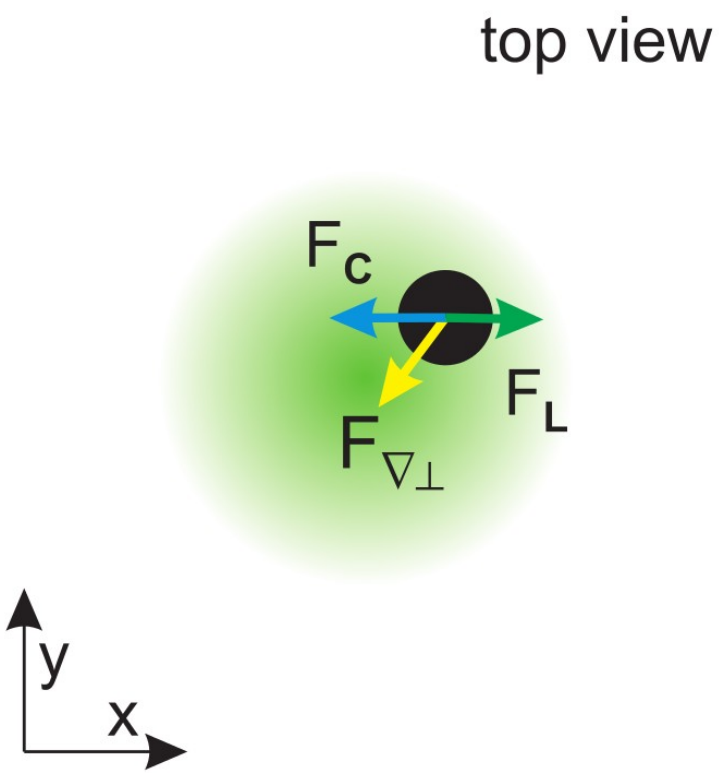


Isotropy of the trap



How does the trap work ?





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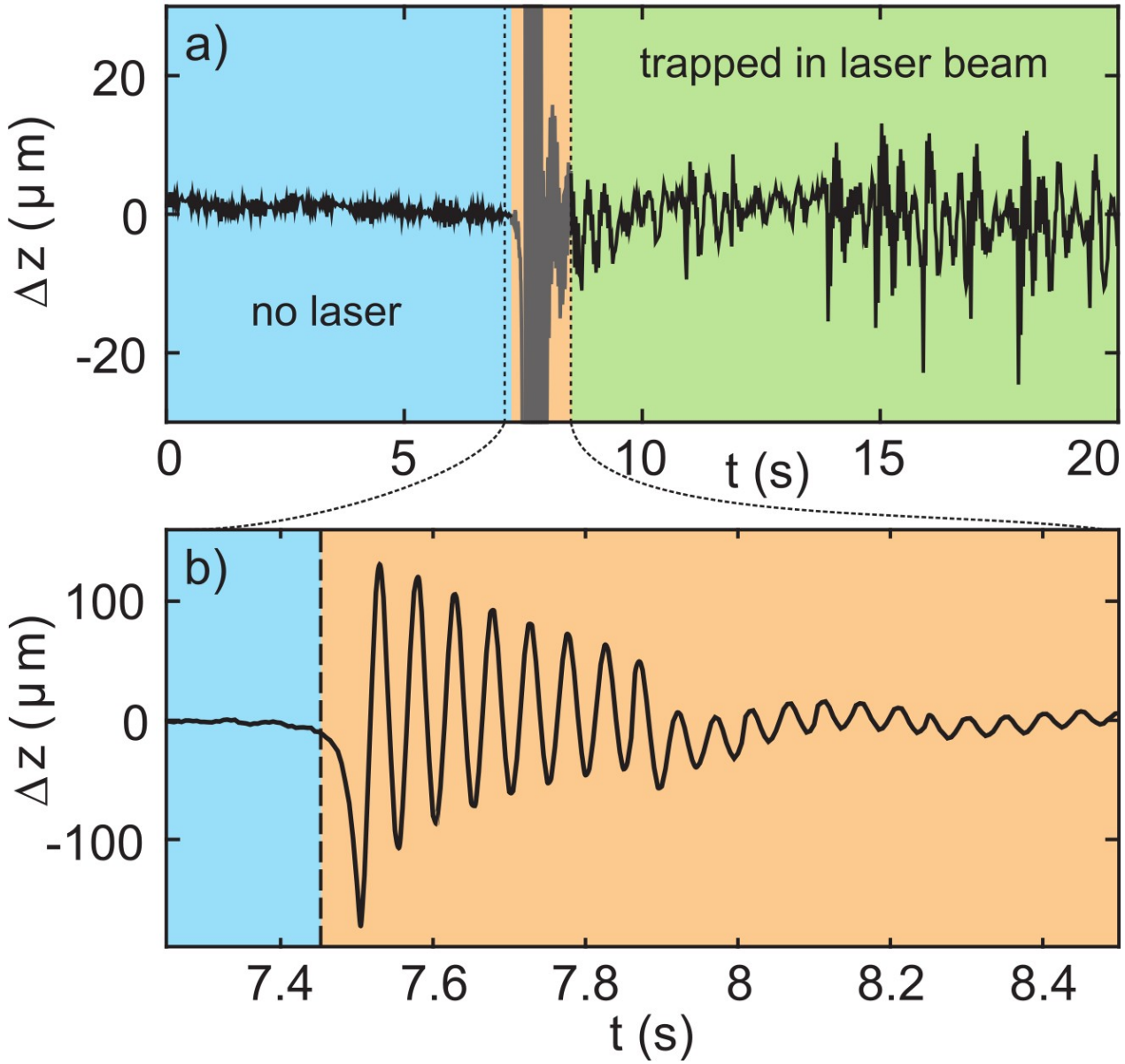
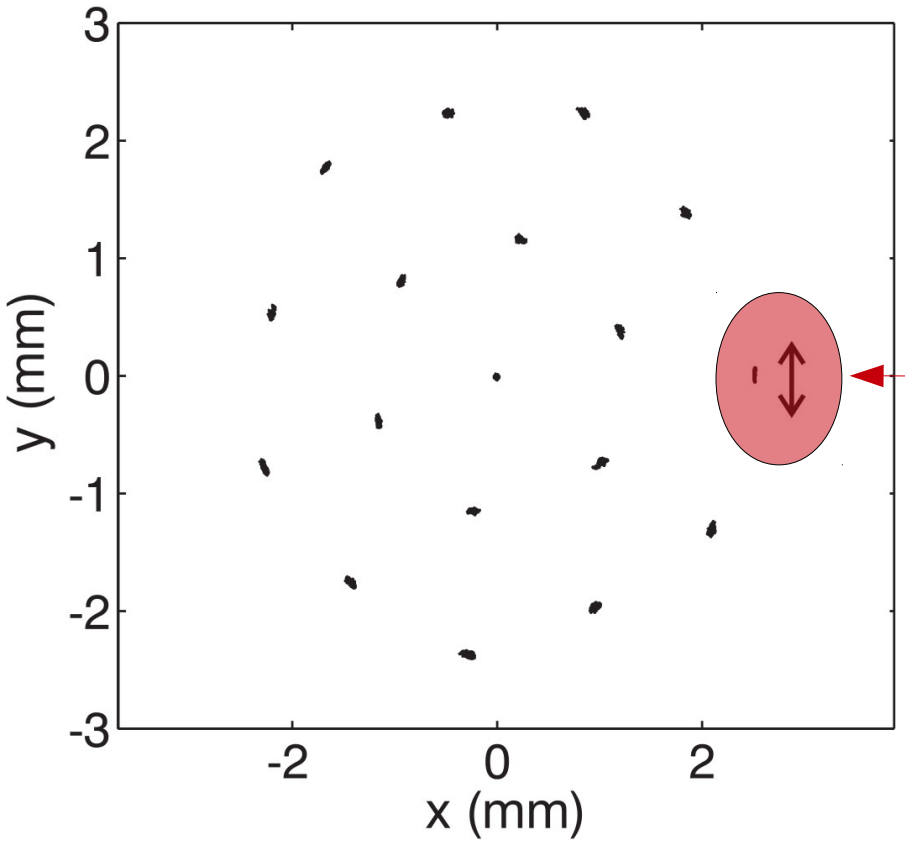
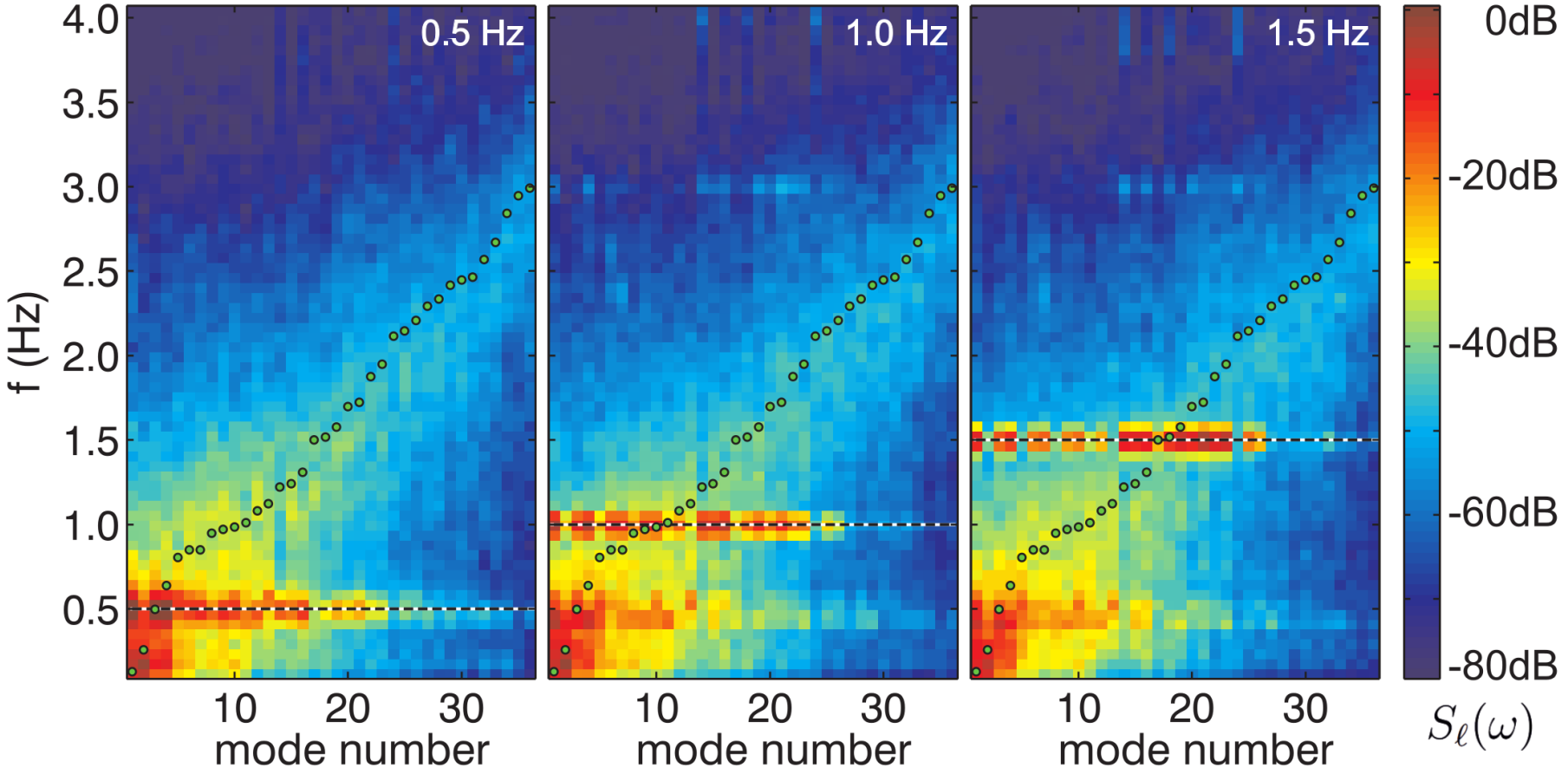


Example 2: Controlling dynamics



sinusoidal motion
of trapped particle

Example 2: Controlling dynamics



Publications

- mode excitation and diffuse refelctions

  Phys. Plasmas **22**, 023703 (2015)

- optical tweezer for complex plasmas

  Phys. Plasmas **22**, 043703 (2015)