

thursday, january 29 / 2004

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*Can we use an embedded self assembled
quantum dot to cool a nano-mechanical
resonator?*

A possible scheme of laser cooling a mechanical beam structure will be presented. The idea is to confine the phonons in the beams to enhance their interactions with an embedded single quantum dot (SQD). Provided that one has both high mechanical quality factors (Q's) at frequency exceeding 100 MHz for the beam and QD exciton transition that are broadened solely by spontaneous emission, one could cool and manipulate discrete phonon modes using optical excitation. To achieve high mechanical Q's, the mass of the beam must be minimized, which will bring the quantum dot into close proximity with the surface of the material. This in turn may broaden and degrade the optical performance of the structure. Accordingly, we have carried out a systematic measurement to study the changes of a SQD's linewidth with approaching surface. We found that the linewidth is broadened by surface states when their distance is about 12 to 40 nm.

We emphasize that for these distances, quantum tunneling effect does not play a role.

thursday january 29 at 4 pm
department conference room (3302 broida)

winter quarter schedule
<http://www.iquest.ucsb.edu/sites/cleland/classes/cmseminar/index.html>