

Kapitza-like Modulation of Near-Field Radiative Heat Transfer

Mauro Antezza

*Laboratoire Charles Coulomb, Université Montpellier and CNRS, Place Eugène Bataillon -
cc 074, Montpellier, 34095, France*

Institut Universitaire de France, 1 rue Descartes, Paris Cedex 05 F-75231, France

We introduce [1] a Kapitza-like mechanism for the near-field radiative heat transfer and show that fast modulation of any parameter controlling the flux, such as the vacuum gap or a material response, produces a quadratic, time-averaged correction in the slow thermal dynamics. This correction splits into a frequency-independent static term and a low-pass dynamical term, yielding sizable modulation-induced temperature shifts and modified effective thermal conductances that can stabilize or destabilize the steady state. Applying the theory to gap modulation between SiC slabs, we derive analytical scaling laws and predict temperature shifts that are fully measurable with existing experimental platforms. Our results establish a thermal analogue of the Kapitza mechanism and provide a general route for controlling radiative heat flow in micro- and nanoscale platforms.

[1] Mauro Antezza, submitted (2025)