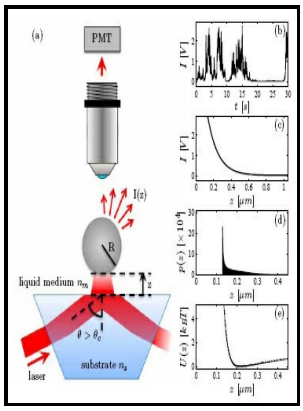
Forces exerted on atoms by a resonant electromagnetic evanescent wave

University of Birmingham - OSA



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Lateral forces on circularly polarizable particles near a surface

The beam forms a tightly focused, circularly symmetric spot in the trapping plane and has an exponentially decaying component in the axial direction. We can visualize particle exchange as analogous to macroscopic phenomena such as two people passing a basketball back and forth, thereby exerting a repulsive force without touching one another.

Lateral forces on circularly polarizable particles near a surface

Estes Park, CO: Space Studies Institute. J Opt Soc Am 1965;55:1205-9.

Extraordinary momentum and spin in evanescent waves

While earlier version of fiber-based laser traps exclusively used single mode beams, M. Each end of the tapered fiber is cleaved and inserted into a fiber-to-fiber splice unit to couple in laser light. After reflection on the substrate at 45° incidence, the incident and reflected wave create a standing wave that results in an elliptically polarized field with spin components parallel to the surface at the location of the particle, as desired.

Lateral forces on circularly polarizable particles near a surface

The field is defined so as to be a characteristic of the object creating it; the field does not depend on the test object placed in it. We derive the force from first principles, considering the dipole as oscillating equal charges with opposite signs ± q, which radiate an electromagnetic field.

[PDF] Mie scattering and optical forces from evanescent fields: a complex

The force applied on the object depends linearly on its displacement from the trap center just as with a simple spring system.

Extraordinary momentum and spin in evanescent waves

Nanoscale force manipulation in the vicinity of a metal nanostructure. Usikov Institute of Radiophysics and Electronics, 12 Ak. At the same time, the complex-angle Mie theory offers considerable advantages including a more transparent and time-saving procedure, use of well-elaborated calculation schemes and software codes.

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