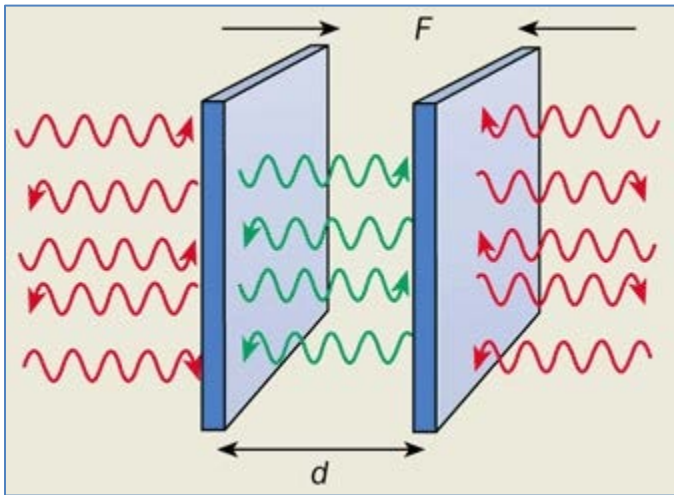


The Casimir effect: a force from nothing

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<https://physicsworld.com/a/the-casimir-effect-a-force-from-nothing/>

The Casimir force is the most famous mechanical effect of vacuum fluctuations. Consider the gap between two plane mirrors as a cavity.



Two mirrors with an area of 1 cm^2 separated by a distance of $1 \text{ }\mu\text{m}$ have an attractive Casimir force of about 10^{-7} N - roughly the weight of a water droplet that is half a millimeter in diameter.

All electromagnetic fields have a characteristic spectrum containing many different frequencies. In a free vacuum all of the frequencies are of equal importance. But inside a cavity, where the field is reflected back and forth between the mirrors, the situation is different. The field is amplified if integer multiples of half a wavelength can fit exactly inside the cavity. This wavelength corresponds to a cavity resonance. At other wavelengths, in contrast, the field is suppressed. Vacuum fluctuations are suppressed or enhanced depending on whether their frequency corresponds to a cavity resonance or not.