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Dynamical Casimir Effect in a Cavity with a Resonantly Oscillating Boundary

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Abstract: We present analytical solutions describing quantized vacuum field in a one-dimensional cavity with one of its two mirrors fixed and another vibrating in simple harmonic form. These solutions are accurate up to the second order of the oscillating magnitude and they are uniformly valid for all time. We obtain the simple analytical expression for the energy density of the field which explicitly manifests that for a cavity vibrating at its q-th ($q \geqslant 2$) eigenfrequency, q traveling wave packets emerge in the finite part of the field energy density, and their amplitudes grow while their widths shrink in time, representing a large concentration of energy. The finite part of the field energy density originating from the oscillations is shown to be proportional to the factor (q^2-1).

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