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Laser Induced Distortion of Band Structure in Solids: an Analytic Model in Three Dimensions

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We consider a spatially periodic (cosine) potential as a model for a crystalline solid that interacts with a harmonically oscillating external electric field. This problem is periodic both in space and time and can be solved analytically using the Kramers-Henneberger co-moving frame. By analyzing the stability of the closely related Mathieu-type differential equation, the electronic band structure can be obtained. In our former study (for one spatial dimension) we successfully demonstrated that by changing the field intensity, the width of the zero-field band gaps can be drastically modified, including the special case when the external field caused the band gaps to disappear.

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