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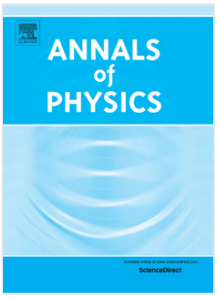

Discrete coherent states for higher Landau levels

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Discrete coherent states for higher Landau levels

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Abstract

We consider the quantum dynamics of a charged particle evolving under the action of a constant homogeneous magnetic field, with emphasis on the discrete subgroups of the Heisenberg group (in the Euclidean case) and of the $SL(2,\mathbb{R})$ group (in the Hyperbolic case). We investigate completeness properties of discrete coherent states associated with higher order Euclidean and hyperbolic Landau levels, partially extending classic results of Perelomov and of Bargmann, Butera, Girardello and Klauder. In the Euclidean case, our results follow from identifying the completeness problem with known results from the theory of Gabor frames. The results for the hyperbolic setting follow by using a combination of methods from coherent states, time-scale analysis and the theory of Fuchsian groups and their associated automorphic forms.

Key words: Coherent states, Landau Levels, Quantization, Heisenberg group, Affine group, discrete groups

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