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A spectral force based version of the Wigner-Liouville equation MAARTEN VAN DE PUT, WIM MAGNUS, BART SOREE, Univ of Antwerp, imec — Traditionally, a direct numerical solution of the Wigner-Liouville (WL) equation has been plagued with high computational burden and instability inherent to the integration of the highly oscillatory Wigner potential kernel. We have developed a method based on the spectral decomposition of the force which recasts the WL equation into a manageable form. By removing one integral, this new form is computationally less demanding. Furthermore a damping term naturally appears which reduces the instability caused by the oscillatory terms. Finally, the new form is local in position as opposed to the original WL equation which is non-local in both position and momentum. The spectral force WL equation is interpreted as representing two processes; a classical evolution with a constant force, and a local quantum generation term with positive and negative contributions mediated by the spectral components of the force. This interpretation allows for a straightforward implementation using a finite difference scheme for the classical evolution coupled with direct evaluation of the discretized generation terms. We observe a good match between results obtained using our method and theoretical results.

Maarten Van de Put
Univ of Antwerp

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