

The problem of radiation reaction in intense laser fields

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It is well-known that interacting fields pose fundamental problems. A prototypical example is radiation reaction. The well-known LAD equation in the context are of little use since they are ill-defined. Up to now it is not fully clear how to derive consistent equations of motion for interacting fields. We propose to give up the notion that electrons are point-like or in other words are represented by simple worldlines in spacetime. Instead, we assume that electrons are fundamental 2D objects in the latter. The equations we derive from this assumption show no unphysical properties as do the LAD equations. We can also hint at why the LAD equations seem to fail. In the wake of our derivation the concept of emergent inertia occurs. Inertia, as it seems, is a direct consequence of interaction. Our new equations can be solved numerically in a much more efficient way than the Landau-Lifshitz equations. Hence, they might serve as a replacement for appropriate equations of motion in the context of high field laser-matter interaction in the future.

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