

Abstract Submitted  
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**Renormalized linear gyrokinetics and recovery of ideal magnetohydrodynamics**<sup>1</sup> L.-J. ZHENG, M. KOTSCHENREUTHER, J. W. VAN DAM, Institute for Fusion Studies, University of Texas at Austin — The gyrokinetic formalism provides expeditious means for the kinetic analysis of both macro and micro plasma instabilities. In this work, we revisit linear electromagnetic gyrokinetics theory and find that the  $J_0 \times \delta B$  effect on force balance is missing and the FLR effect is not retained fully in the conventional formalism. We show that two key modifications are needed to get consistent ordering in gyrokinetics: First, the gyrophase-dependent part of the perturbed distribution function, as well as its coupling to the gyrophase-independent distribution function, should be retained. Second, the solution of the equilibrium gyrokinetic distribution function should be carried out to sufficiently high order. With these modifications we can recover linear MHD from this new gyrokinetic formalism. New effects and potential future applications of this gyrokinetic theory will be discussed (*e.g.*, to resistive wall modes).

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