Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Comparitive multi-code study of finite-size gyrokinetic electromagnetic instabilities[1] TOBIAS GÖRLER, NATALIA TRONKO, WILLIAM A. HORNSBY, ALBERTO BOTTINO, RALF KLEIBER, Max Planck Institute for Plasma Physics, CLAUDIA NORSCINI, VIRGINIE GRANDGIRARD, CEA, IRFM, FRANK JENKO, University of California, Los Angeles, ERIC SONNENDRÜCKER, Max Planck Institute for Plasma Physics — Given the recent extensions of global gyrokinetic (GK) codes towards a comprehensive and self-consistent treatment of electromagnetic (EM) effects, corresponding verification tests are necessary steps to be taken. While a number of (semi-)analytic test cases exist in the axisymmetric limit, EM microinstabilities and turbulence are rarely addressed. In order to remedy this problem, a hierarchical linear GK benchmark study is presented starting with electrostatic (adiabatic electron) ion temperature gradient microinstabilities and progressing finally to the characterization of fully EM instabilities as a function of the pressure ratio β. Results from numerical schemes as different as Eulerian Vlasov, Lagrangian PIC, and Semi-Lagrange codes are shown. The EM microinstability benchmark itself is carried out by various PIC and Vlasov codes, thus confirming a high degree of reliability for the implementation that has never been achieved so far in this context. Insights regarding mode structure characteristics and associated resolution requirements which will be relevant for future global EM studies are highlighted. Finally, extensions into the physically more relevant nonlinear turbulence regime will be discussed.

[1]Carried out within the EUROfusion Consortium framework (grant agreement No 633053).

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Date submitted: 14 Jul 2016 Electronic form version 1.4