Asymptotic-Preserving scheme for the Fokker-Planck-Landau-Maxwell system in the quasi-neutral regime.

Sébastien GUISSET, Institut de Mathématiques de Bordeaux

Stéphane BRULL, Institut de Mathématiques de Bordeaux

Emmanuel d'HUMIÈRES, Laboratoire CELIA

Bruno DUBROCA, Laboratoire CELIA

This work deals with the numerical resolution of the Fokker-Planck-Maxwell system in the quasi-neutral regime. In this regime the stiffness of the stability constraints of classic schemes causes huge calculation times. That is why, we introduce a new stable numerical scheme consistent with the transitional and limit models. Such schemes are called Asymptotic-Preserving (AP) schemes in literature. This new scheme is able to handle the quasi-neutrality limit regime without any restrictions on time and space steps. This approach can be easily applied to angular moment models by using a moments extraction. Finally, two physically relevant numerical test cases are presented for the Asymptotic-Preserving scheme in different regimes. The first one shows the efficiency of the Asymptotic-Preserving scheme in the quasi-neutral regime whereas the second one on the contrary corresponds to a regime where electromagnetic effects are predominant.

Sébastien GUISSET, Univ. Bordeaux, CELIA, UMR 5107, F- 33400 Talence, France. Univ. Bordeaux, IMB,UMR 5251, F- 33400 Talence, France
guisset@celia.u-bordeaux1.fr
Stéphane BRULL, Univ. Bordeaux, IMB, UMR 5251, F-33400 Talence, France. CNRS, IMB, UMR 5251, F-33400 Talence, France.
Stephane.Brull@math.u-bordeaux1.fr
Emmanuel d'HUMIÈRES, Univ. Bordeaux, CELIA, UMR 5107, F-33405 Talence, France. Univ. Bordeaux, IMB, UMR 5251, F- 33400 Talence, France
dhumieres@celia.u-bordeaux1.fr
Bruno DUBROCA, Univ. Bordeaux, CELIA, UMR 5107, F- 33400 Talence, France. Univ. Bordeaux, IMB, UMR 5251, F- 33400 Talence, France
dubroca@celia.u-bordeaux1.fr