

Final Report

Name of BritInn Fellow: José Antonio Carrillo

Home Department: Mathematical Institute **Home University:** University of Oxford

Guest Department: Institut für Mathematik **Guest University:** Universität Innsbruck

From: May 28, 2022 **Until:** May 31, 2022

Title of the Research Project:

Numerical integration methods for the Vlasov-Maxwell-Landau system

Report about visit and future plans:

The joint research project of J.A. Carrillo and M. Thalhammer is devoted to the development and theoretical investigation of reliable and efficient numerical integration methods for evolution equations arising in kinetic theory. The scope of relevant applications from plasma physics in particular includes the Vlasov-Maxwell-Landau system capturing both, conservation and dissipation. In this context, it is promising to design geometric numerical integrators that preserve conserved quantities in an adequate manner.

The studies and simulations carried out so far are focused on the efficient and reliable evaluation of the Landau collision operator with Coulomb interaction. Amongst others, this involves the computational issues of high-dimensional problems and singular integral kernels. During the visit of J.A. Carrillo, the current approach could be analysed and advanced in several respects. Moreover, relevant extensions to be considered in the future could be discussed.

The guest lecture held by J.A. Carrillo on May 30 at the Campus Technik included a variety of applications and illustrative examples. It in particular attracted numerous students in mathematics and physics. See attachment.

Picture Credits

Photo 1: Guest lecturer J.A. Carrillo

Photo 2: J.A. Carrillo is currently responsible for a thematic semester programme at the Isaac Newton institute for mathematical sciences in Cambridge. A slide in his talk highlights Newton's like differential equations.

Photo 3: A top mathematician on top of Innsbruck's north chain.



