Annual meeting of the team RAPSODI

1 Schedule

9h30-10h15 : **Clément Cancès**

10h15-10h45 : Coffee break

10h45-11h15 : **Abdoul Aziz Diallo**

11h15-12h00 : **Pierre Gervais**

12h00-14h00 : Lunch break

14h00-14h45 : **Caterina Calgaro**

14h45-15h15 : **Julian Dorner**

15h15-15h45 : Coffee break

15h45-16h30 : **Simon Lemaire**

16h30- 18h00 : Discussions

2 Abstracts

C. Cancès : TBD TBD

A. A. Diallo : TBD Light sources based on accelerators-such as the SOLEIL synchrotron radiation facility (in Saclay, France)-produce very intense radiation over a very wide spectral range (from THz to hard X-rays). This radiation is produced to enable research teams to probe the properties of their samples of matter (gases, solids, biological molecules, etc.). The relativistic electron bunches that emit the radiation are complex media, interacting with each other and with their environment, where instabilities are systematically encountered. These can be both a source of limitations, or on the contrary, the origin of much more intense coherent radiation (more than 10,000 times, particularly in the terahertz range).

This thesis is focused on understanding the dynamics of electron bunches to control this instability by mainly numerical study of the Vlasov-Fokker-Plank(VFP) equation used to model the dynamic of the

electron bunches by tracking their phase-space density distribution. Particular attention is given to the computation, stability analysis, and bifurcation analysis of periodic orbit solutions of the electron bunch dynamic. This focus is motivated by the critical role that periodic orbit solutions play in controlling microbunching instability (feedback control in chaotic systems).

In this talk, we will present numerical approach for computing periodic orbit solutions, focusing on the Newton and Newton-Picard methods, and illustrate their use through toy models and their respective challenges. Additionally, we will discuss the application to the non-linear 1D Mckean-Vlasov equation which exhibits properties similar to those found in the VFP model.

Keywords : Particle accelerators, Non-linear dynamics, Periodic solutions, Bifurcation

P. Gervais : TBD TBD

C. Calgaro : TBD TBD

J. Dorner : TBD TBD

S. Lemaire : TBD TBD