Abstract

In the LHC almost 3000 bunches in each beam will collide near several experimental regions and experience head-on as well as long range beam-beam interactions. In addition to single bunch phenomena, coherent bunch oscillations can be excited. Due to the irregular filling pattern and the un-symmetric collision scheme, a large number of possible modes must be expected, with possible consequences for beam measurements. To study these effects, a simulation program was developed which allows to evaluate the interaction of many bunches. It is flexible enough to easily implement any possible bunch configuration and collision schedule and also to study the effect of machine imperfections such as optical asymmetries. First results will be presented and future developments are discussed.

COMBI: Coherent Multi Bunches Interaction code (*)

First Applications: rigid Gaussian bunches to study the oscillation modes produced by head-on and local, parasitic interactions

Study the oscillation modes induced in the bunches by excitation mechanisms with different beam and machine configurations

- different symmetries in the collision scheme symmetric and non-symmetric collision schemes
- different interactions (head-on, long range, Pacman effects)
- single bunch excitation or multi bunch (e.g. for tune measurements)

PURPOSE: realistic scenarios of the oscillating modes for possible LHC configurations to define different corrections which can minimize the number of modes that may obscure tune measurements and feedback systems

Simple Examples of Tune Spectra for Different Configurations

Conclusions

Expectations: suppression of a significant number of modes in the neighbourhood of the 0-mode

detailed studies of the Super PacMan Effects with long range interactions

Future Studies:

- Multi-bunch Multi-Particle Simulations to include Landau Damping Effects due to the Incoherent Tune Spread and studies of Emittance Growth

Implement to Parallel Computation