

**Accelerator Physics Issues in the LHC,**  
J. GAREYTE, CERN - In order to compensate for the scarcity of events at very high energy the LHC has to provide a luminosity of  $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ , that is about 50 times the present world record. This is obtained with a large beam current distributed over 2835 particle bunches, and a large transverse bunch density so as to operate close to the beam-beam limit. The single bunch and multibunch collective instabilities are kept under control by a proper design of the beam enclosure and by feedback systems. The beam-beam interaction has two components, the head-on interaction as in previous colliders with few bunches and the long range interaction due to multiple unwanted crossings. This last effect is controlled by letting the beams collide at a small angle. The unavoidable imperfections of the high field superconducting magnets create non-linear field errors which limit the useful range of particle betatron amplitudes where the motion is stable, the so-called Dynamic Aperture. For the same magnet quality this effect is enhanced in large machines like the LHC. An extended set of corrector magnets is foreseen to compensate for the effects of the strongest multipoles of low order. The machine lattice is designed with the aim of leaving sufficient freedom in the choice of the operating conditions to optimize performance.