

## **Mechanical and Vacuum Stability Design Criteria for the LHC Experimental Vacuum Chambers,**

I.R. COLLINS, O. GRÖBNER, P. LEPEULE, R. VENESS, CERN - Four colliding beam experiments are planned for the Large Hadron Collider (LHC). Each require an experimental vacuum chamber in which the counter-circulating proton beams will collide at the interaction point (IP). The beampipe should be as transparent as possible to scattered particles for background reasons. In addition, physics necessitates that detectors are located as close as possible to the IP and traversing beams, resulting in small diameter beampipes. This, together with the bunched beam structure, makes ion induced pressure bump instability, well-known from the Intersecting (proton) Storage Ring (ISR) at CERN, a potential problem. Adequate conductance, cleanliness of the beampipes and sufficient pumping speed are required to avoid this instability. Electron cloud instability in the LHC experimental vacuum system could also be a serious problem and appropriate surface coatings and cleaning procedures may be necessary. Small beampipe diameters must be consistent with mechanical aperture for the beams and allow margin for alignment and stability inside detectors. Design criteria to ensure both local and global stability under static and dynamic mechanical loads are defined. This paper will discuss these issues and present requirements for both vacuum and mechanical stability, giving current solutions to some of these problems.