Electron Cloud Memory Effects

F. Petrov

[a] *Institut für Theorie Elektromagnetischer Felder (TEMF), Technische Universität Darmstadt, Schloßgartenstr. 8 64289 Darmstadt*

Abstract

Electron cloud is a concern for many modern and future accelerator facilities. There are a number of undesired effects attributed to the presence of electron clouds. Among them are coherent instabilities, emittance growth, cryogenic heat load, synchronous phase shift and pressure rise. In long bunch trains one can observe the emittance growth getting faster along the train. This coupled bunch effect is mainly due to the growing electron cloud density along the bunch train. In this paper we address other mechanisms that can lead to the coupled-bunch electron cloud effects.

We start our analyzis assuming a perfectly circular beam pipe of radius R_p. Moreover, we assume that bunches propagating through this pipe are short longitudinally and much smaller than R_p transversly. Additionally, the electron cloud populating this pipe is radially symetric as well.

The numerical model is the same as in Ref.[Petrov2014]. In this section we focus on the dipole region mainly. In reality primary electrons are bound to the magnetic field lines. Moreover, secondary electrons move along approximately the same field lines as the primary ones. Thus the electrons stay approximately in one and the same plane and the approximation of 2D grid and 2D electron motion is rather valid. In contrast in field-free regions physical electrons can move freely in all the directions. Hence, in the gap between two consecutive bunches