Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, 18.09.2018

(16:00 in Room 459/30b)

Higher Harmonic SRF Cavities for the Upgrade

of the BESSY II Storage Ring

Andranik Tsakanian

HZB

Abstract

The BESSY Variable pulse length Storage Ring (VSR) project is a future upgrade of the 3rd generation BESSY II light source. The key feature of the project is the simultaneous storage of long (ca. 15 ps) and short (ca. 1.7 ps) electron bunches under "standard" user optics. This challenging goal requires installation of SRF higher harmonic cavities of the fundamental 500 MHz at two different frequencies. Therefore, four new SRF cavities (2× 1.5 GHz and 2× 1.75 GHz) have been designed. These cavities will operate in CW mode at high gradients of 20 MV/m. The combination of these factors with a high beam current ($I_b = 300$ mA) make the cavity design a challenging goal, since stable operation must be ensured. Thus, special attention was paid to the damping of HOMs excited by the beam that may otherwise lead to coupled bunch instabilities. The multi-cell SRF cavity integration into the existing storage ring requires also HOM spectrum control during the cavity design phase to ensure the off-resonance condition with circulating beam. The design aspects and challenges of those SRF cavities for storage ring application will be presented.

The HOM power levels for different cavity arrangements in the SRF module will be discussed. A dedicated spectral weighting technique for calculation of RF power propagation due to the HOMs excited by the circulating beam in SRF cavities will be introduced. This evaluation procedure is used for the calculation of the expected HOM powers (broadband) to be absorbed in the RF loads and of the efficiency of HOM dampers in terms of power flow balance between fundamental coupler, HOM waveguides and beampipes. The HOM power levels for complete cold string with warm elements outside the SRF module will be presented as well.

W.Hillert, (Univ. HH), I.Agapov (MPY) and M.Vogt (MFL).

Visit our web site at `http://www-mpy.desy.de/AccPhySemDESY/index.html`