Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, 30.10.2012

(16:00 in Room 459/30b)

Beam Position Diagnostics with HOMs
in 3rd Harmonic SC Cavities at FLASH

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Abstract

Higher order modes excited by the beam in an accelerating cavity contain beam position information. We plan to make use of the dipole modes induced in third harmonic 3.9 GHz accelerating cavities at FLASH for beam alignment and measurement of transverse beam positions. Due to the dense spectrum of modes and the couplings among cavities, it is considerably more challenging for the realization of the diagnostics principle previously proved in TESLA 1.3 GHz cavities at the same linac. A comprehensive series of simulations and measurements have pinned down three modal options potentially suitable for position diagnostics. Recent measurements with custom-built test electronics suggest a resolution of 50 μm accuracy in predicting local beam position in the cavity and a global resolution of 20 μm over the complete ACC39 module. This constitutes the first demonstration of HOM-based beam diagnostics in a third harmonic 3.9 GHz superconducting cavity module. These studies have finalized the design of an online HOM–BPM system for 3.9 GHz cavities at FLASH. Based on these studies, we anticipate providing similar HOM diagnostics for the European XFEL third harmonic module consisting of more cavities.

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