FZU Institute of Physics of the Czech Academy of Sciences

FORTE

Invitation

to the seminar of Division of Elementary Particle Physics of the Institute of Physics of the Czech Academy of Sciences and

to the 2nd FORTE colloquium

Adrian Oeftiger

John Adams Institute for accelerator science,

University of Oxford

On particle beam resonances and instabilities, or how to tame your synchrotron!

Abstract: Space charge is a major performance limitation for hadron synchrotrons, e.g., at CERN, GSI, ISIS, SNS, CSNS, BNL, JPARC and FNAL. The interaction of the beam particles with the beam self-fields, which are typically nonlinear, leads to a betatron tune spread. This spread in the transverse particle oscillation frequencies increases with the bunch intensity, which eventually makes the bunch suffer from nearby betatron resonances. A maximum intensity, i.e., the space charge limit, is reached when these resonances excite the particle distribution to large enough amplitudes inducing beam loss.

This talk reviews the key resonance mechanisms identified over the recent years, demonstrating them with modern modelling tools used for the prediction of the space charge limit. We then discuss compensation methods to increase the space charge limit. As a highlight we cover a recently published approach with pulsed electron lenses, which is currently pushed forward at the dedicated test facility IOTA (FNAL) and GSI.

When: Thursday, March 27, 2025 at 2PM

Where: Dvořák hall, FZU, Pod Vodárenskou věží 1, Prague

For more information, please see https://indico.fzu.cz/event/285/

Roman Lysák Jiří Hejbal