

Beam dynamics with a crab cavity

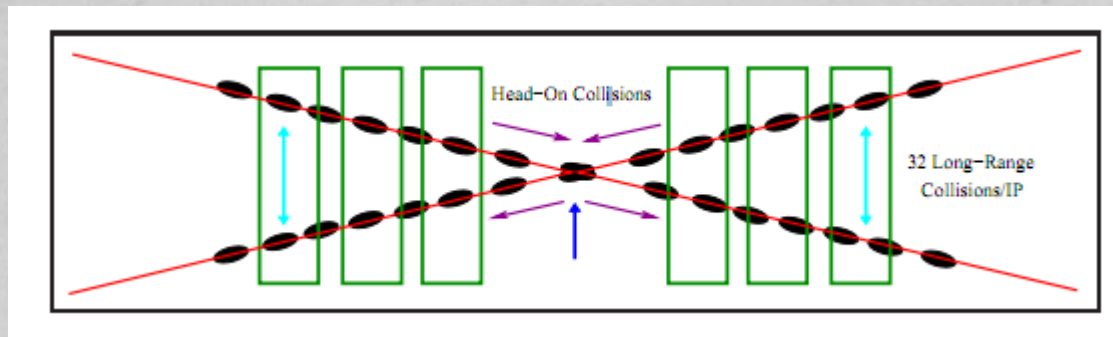
Keren Li

Supervisor: Tanaji Sen

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What is a crab cavity and why bother?

Long range interaction without crab cavity causes geometrical luminosity loss:



A crab cavity deflects the beams transversely and can increase luminosity.

But nonlinear EM fields in the cavity may cause accidental beam loss.

We study the effects of a crab cavity by analyzing data from a J lab model.

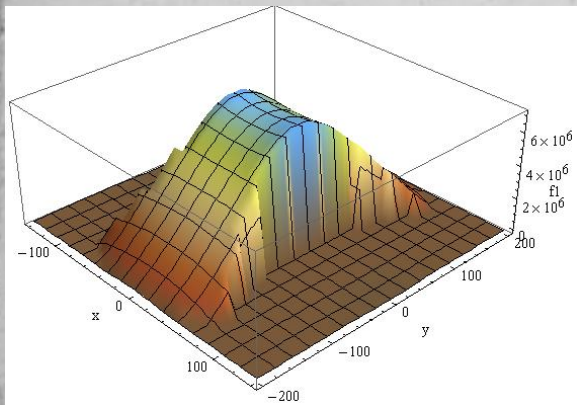
Picture taken from Calage et al. "LHC CRAB-CAVITY ASPECTS AND STRATEGY"

Beam dynamics

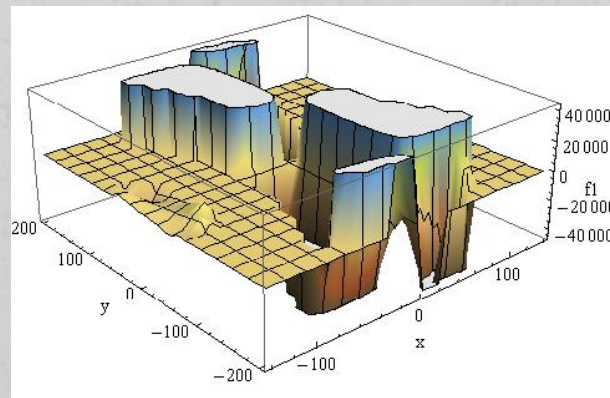
Equations of motion of a particle are given in terms of the field (E, H) components and their first order partial derivatives.

We have discrete measurements of field components from J lab, therefore we want to interpolate the data as well as take the derivatives in order to study the beam motion.

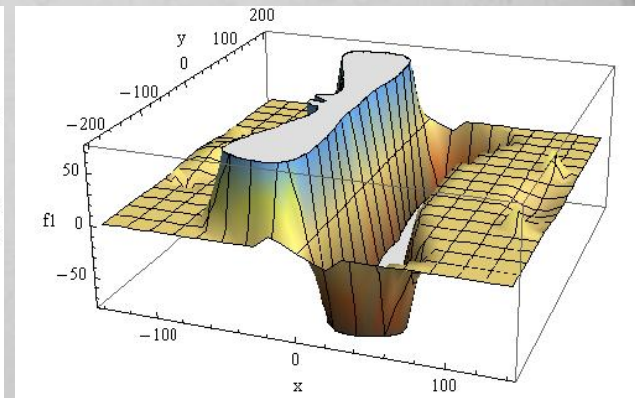
Some interpolation results using Mathematica.



E_y vs (x,y)



E_y vs (x,y)



E_y vs (x,y)

Problems and further studies

In the analytical function test, large errors are seen when the data changes quickly

Large error in numerical differentiation through interpolation, especially near local extrema

We are working on solving those problems and applying the numerical results to solving the EOMs.