INTENSITY-DEPENDENT EMITTANCE TRANSFER : COMPARISON BETWEEN THE 2D SIMPLE MODEL AND 2D SIMULATIONS WITH THE 3D CODE IMPACT IN THE DYNAMIC CASE

Slow synchrotron motion compared to the crossing time

Elias Métral

$\Longrightarrow$ **Follow-up of the LCE meeting of 17-09-04**

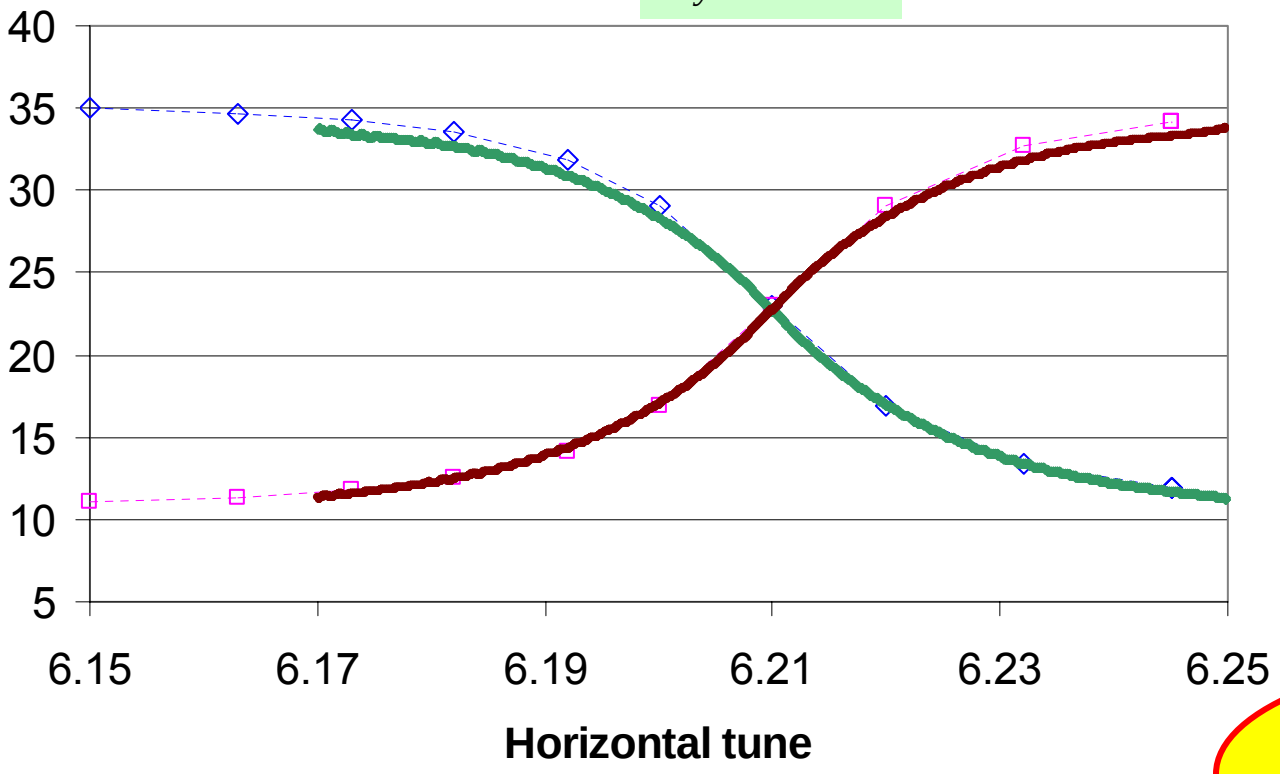
$\Longrightarrow$ **Presented at the last ICFA-HB 2004 workshop (not very well received…)**

2D THEORY vs. SIMULATIONS

DYNAMIC CASE in 2003

(the horizontal tune was changed linearly from 6.15 to 6.25 in 100 ms)

$Q_y = 6.21$



Scaled simulation (4800 turns)

Emit_H from 2D theory
Emit_V from 2D theory
Emit_H from 3D simul.
Emit_V from 3D simul.

Without synchrotron motion $\Longrightarrow$ 2D

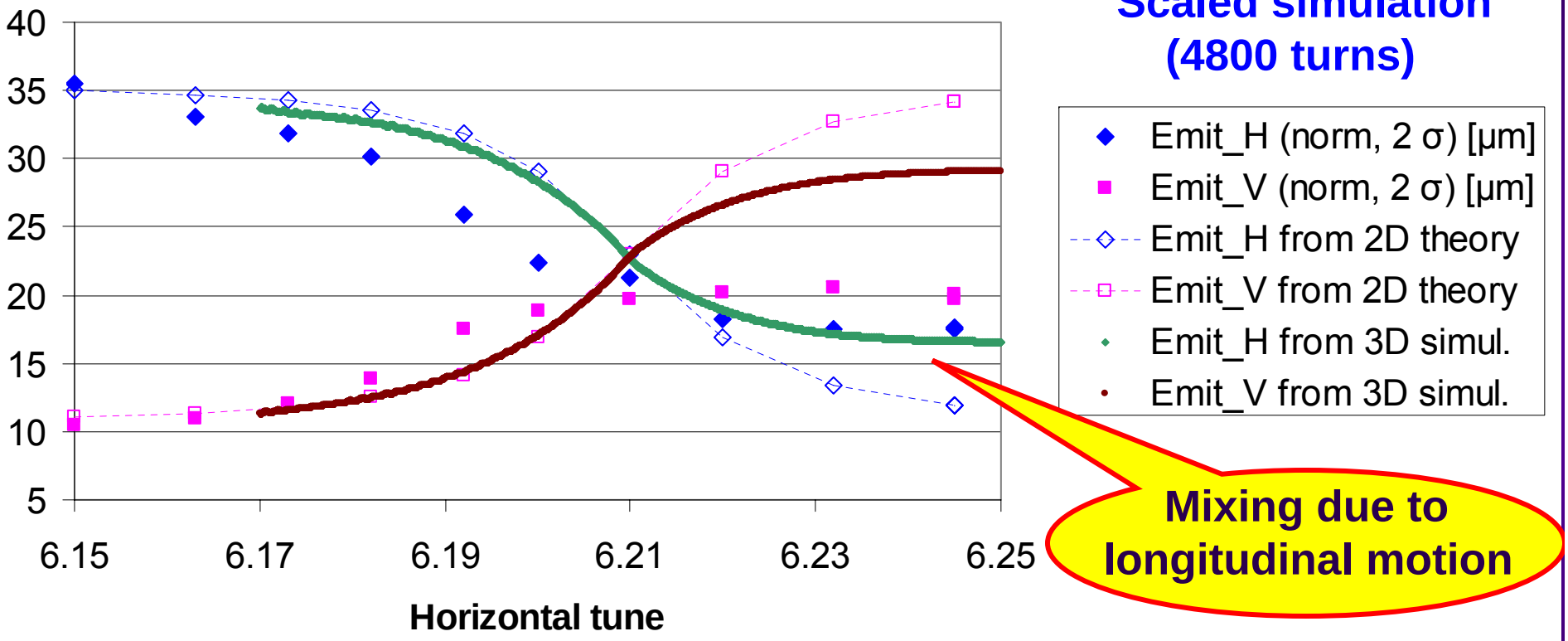
$|C| = 0.036$

$\Delta = 2Q_y - 2Q_x$

MEASUREMENTS vs. 2D THEORY AND 3D SIMULATIONS

DYNAMIC CASE in 2003

(the horizontal tune was changed linearly from 6.15 to 6.25 in 100 ms)



$\Longrightarrow$ **IBS is suspected (by I. Hofmann) to play a role (additional mixing) after the resonance crossing and will be investigated in detail**

COMMENTS

- I proposed to make several comparisons between the simulations and the simple model at the workshop, but this was not accepted… (we are doing few tests however with G. Franchetti…)
- The good approximation of the simulation was even not shown in the summary session…
- I think it deserves more: This highly nonlinear mechanism… seems to be described by only 2 parameters (the coupling strength and the tune distance from the resonance) $\Longrightarrow$ This is interesting to check !
- This is why I would like to congratulate M.Furman and F.Zimmermann (last HHH workshop), who, I think, are in the same kind of situation (as I. Hofmann and R. Ryne) for the e^- cloud build-up mechanism …

Overview of Electron-Cloud Simulation Codes

Session 6B

Miguel A. Furman
LBNL

First CARE-HHH APD Workshop on
Beam Dynamics in Future Hadron Colliders and Rapidly Cycling High-Intensity Synchrotrons
CERN, 8-11 November 2004

HHH 2004

Possible future developments

- More “benchmarking”
  - debugging (code should calculate what is supposed to calculate)
  - validation (results should agree with established analytic result for specific cases)
  - comparisons (two codes should agree if the model is the same)
  - verification (code should agree with measurements)
    - ECLOUD simulations vs. SPS measurements
    - POSINST simulations vs. APS and PSR measurements
    - Others…
- Move in 2 opposite directions:
  - More complete, detailed, quantitative predictions
    - Ultimately requires fully self-consistent 3D calculations
  - Simplified descriptions, few parameters, qualitative results with broad applicability
    - Identify a few basic relevant variables and input parameters (MEC code very promising in this regard)