Thick lens model with errors: effect of b2 in dipoles

F.R. LCU 23.09.08

thanks to S.Fartoukh, M.Giovannozzi, T.Risselada, F. Schmidt

Introduction

As application of the PTC new feature to include field errors:

simulate the effect of b2 errors in dipoles on the optics

- only beam 1 considered

Reproduce case of injection test:

- assume perfect matching TI2-LHC ring 1:
  --Twiss with matched initial values at LHC injection point
  --Check with periodic Twiss

- compare resulting optics to V6.503 nominal

Simulation steps

New routines prepared by Frank:

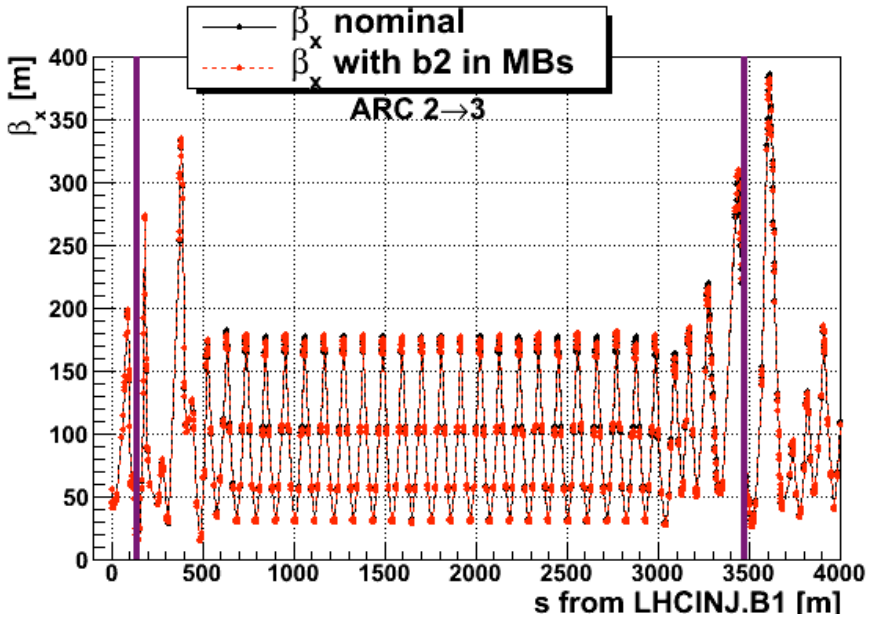
- read error tables used for thin lens model

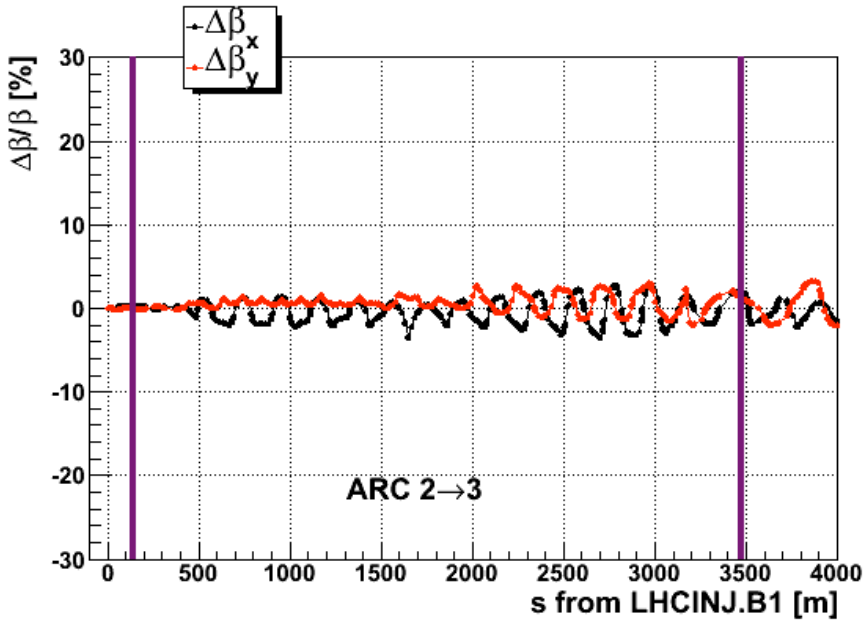
- convert errors by passing through a ‘1 slice’ thick lens model

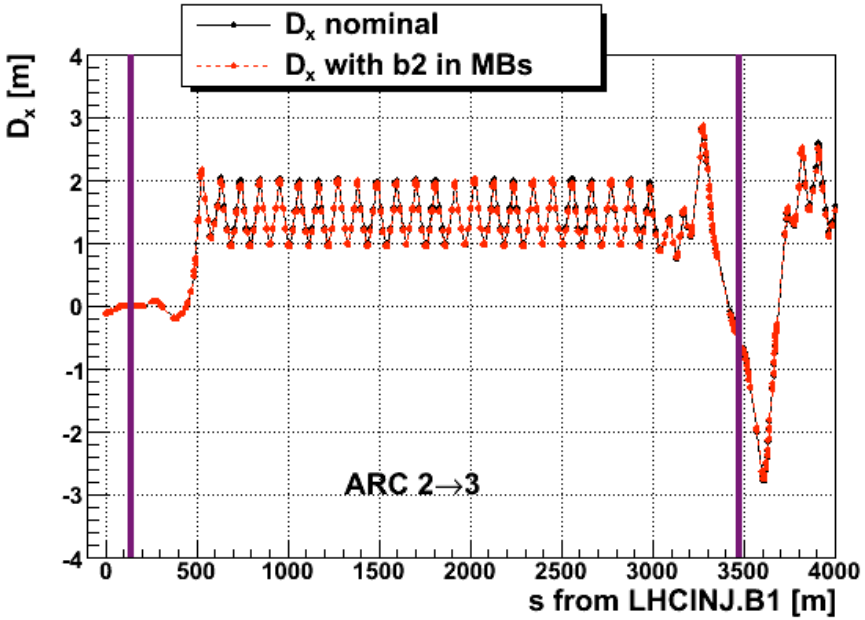
- read back proper values into PTC and make a PTC_TWISS

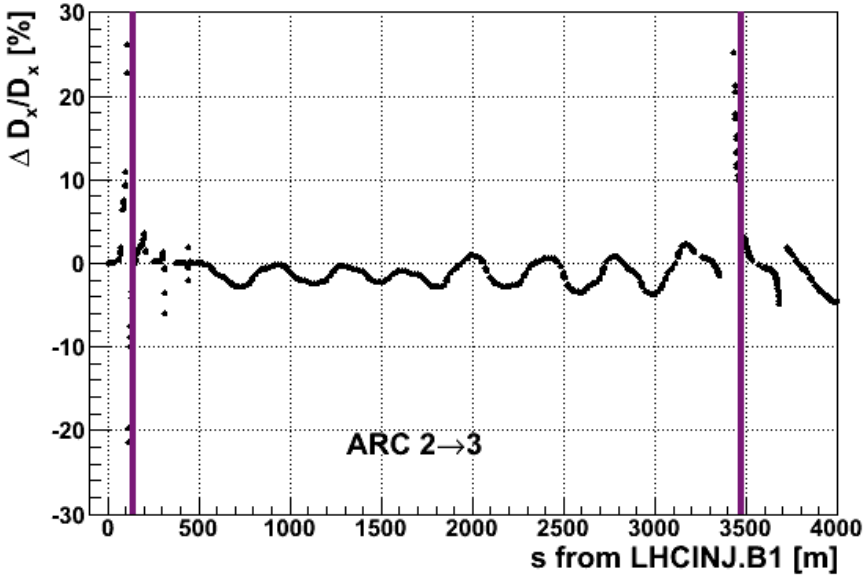
Remind: in the example here there is only the b2 flag on for dipoles, all other errors set to 0.

ARC 2-3

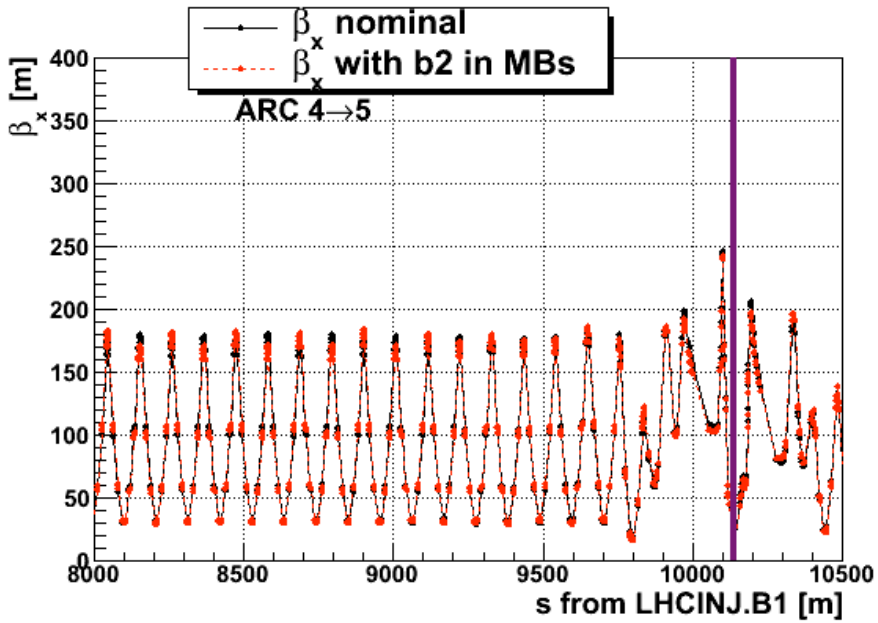

β_x nominal
β_x with b2 in MBs
ARC 2→3
β_x [m]
s from LHCINJ.B1 [m]

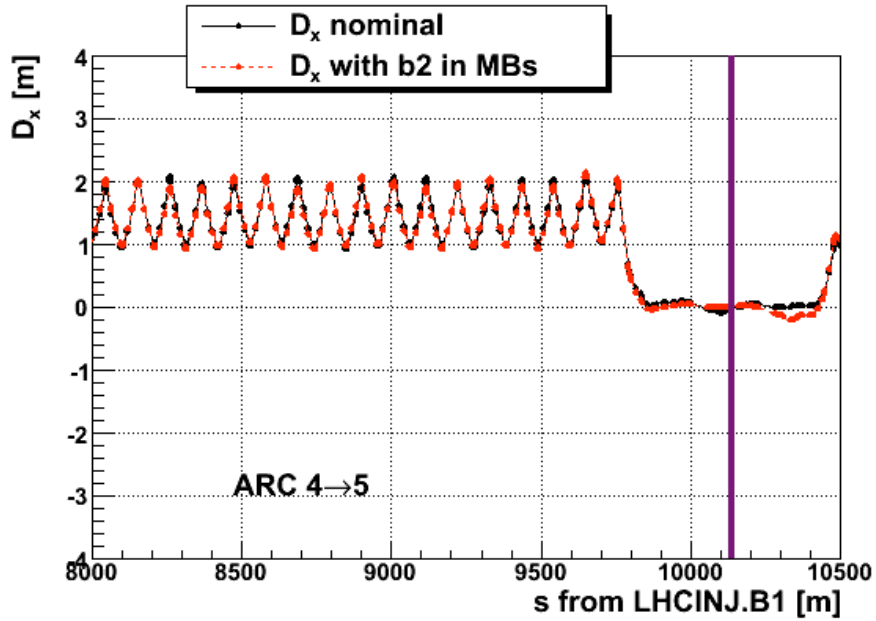

Δβ_x
Δβ_y
ARC 2→3
Δβ/β [%]
s from LHCINJ.B1 [m]

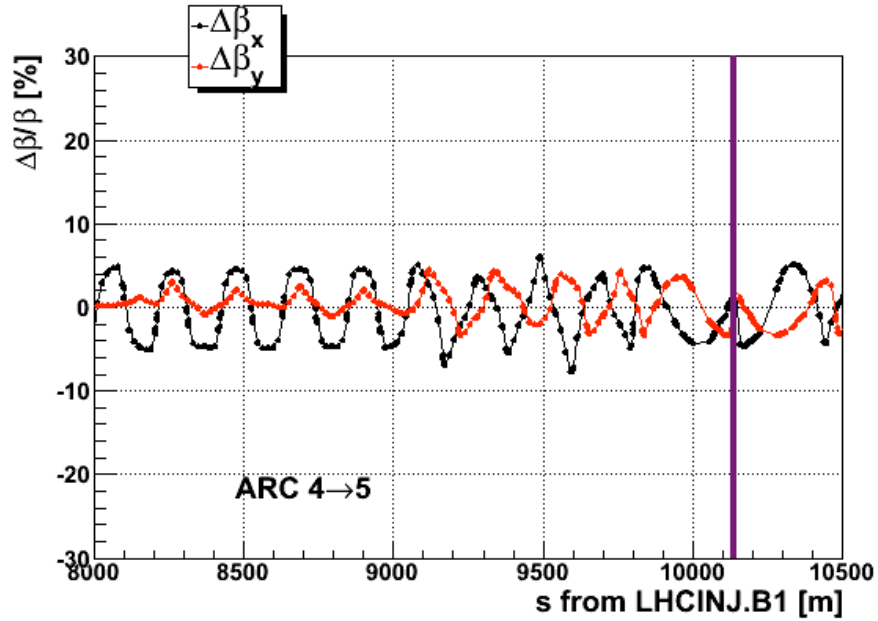

D_x nominal
D_x with b2 in MBs
ARC 2→3
D_x [m]
s from LHCINJ.B1 [m]

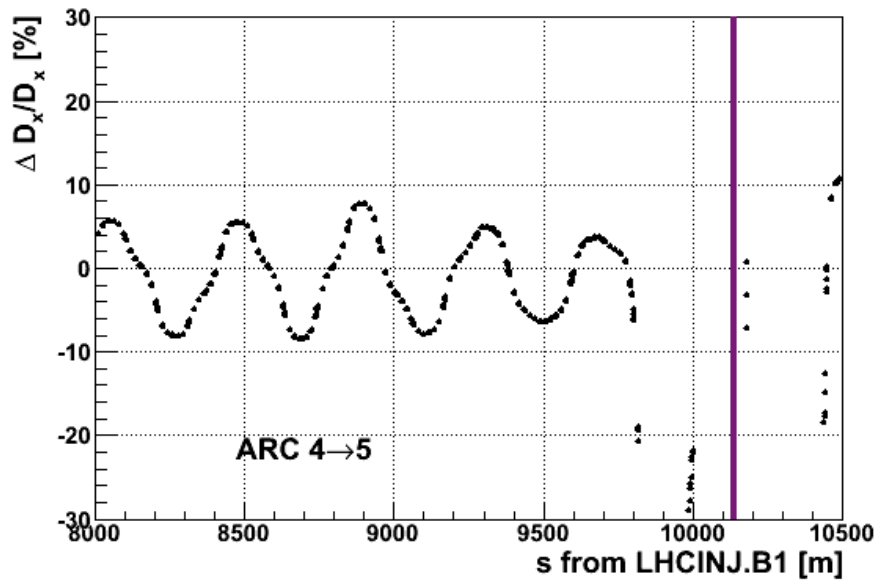

ARC 2→3
Δ D_x/D_x [%]
s from LHCINJ.B1 [m]

IR5

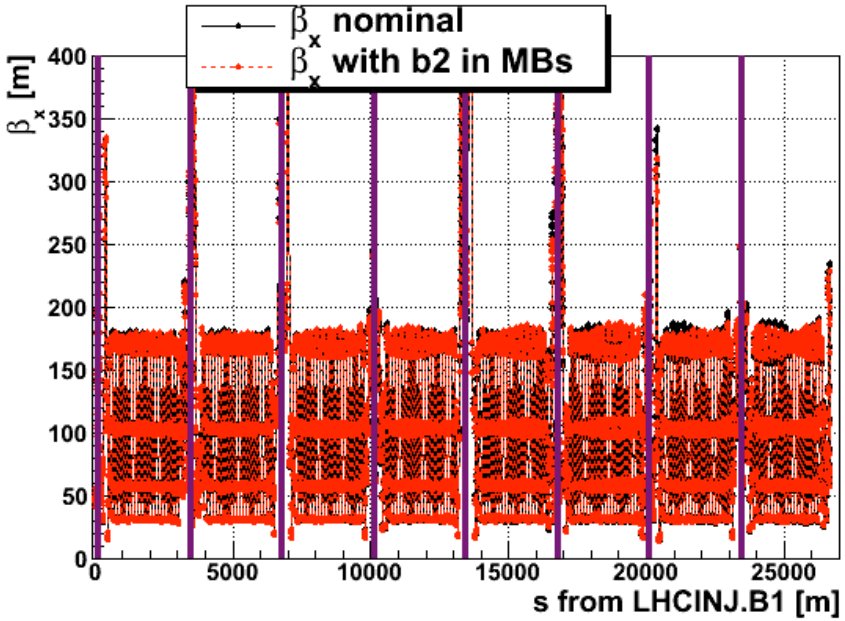

β_x nominal
β_x with b2 in MBs
ARC 4→5
β_x [m]
s from LHCINJ.B1 [m]

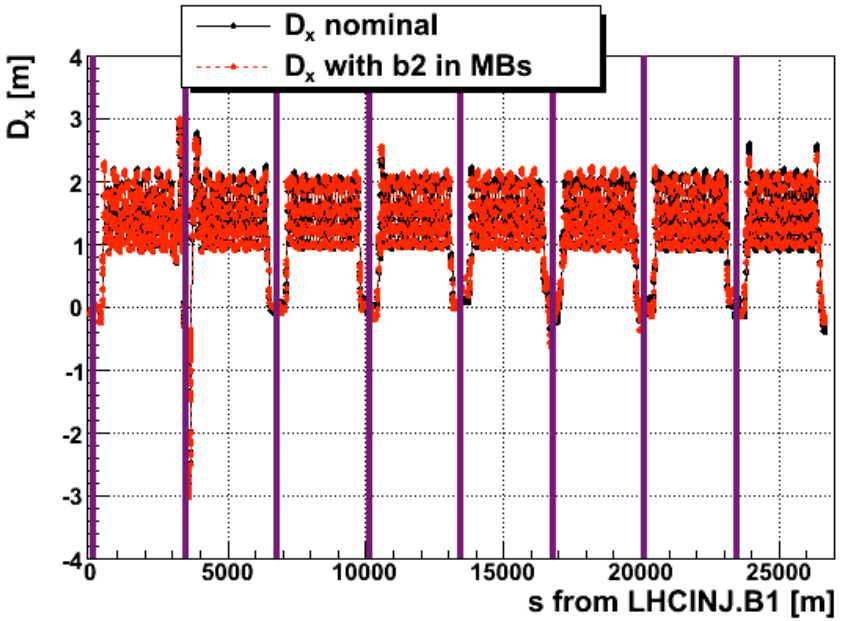

D_x nominal
D_x with b2 in MBs
ARC 4→5
D_x [m]
s from LHCINJ.B1 [m]

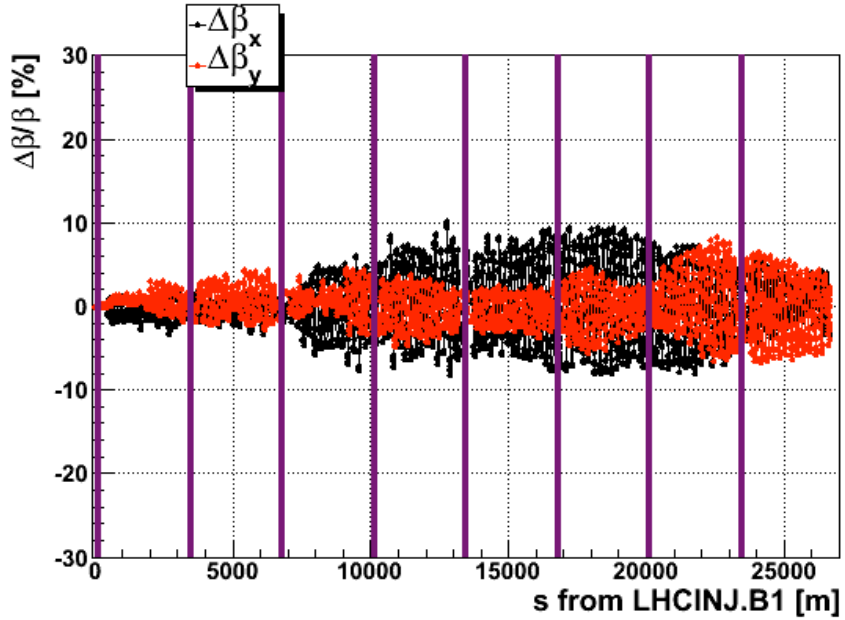

$\Delta\beta_x$
$\Delta\beta_y$
ARC 4→5
$\Delta\beta/\beta$ [%]
s from LHCINJ.B1 [m]

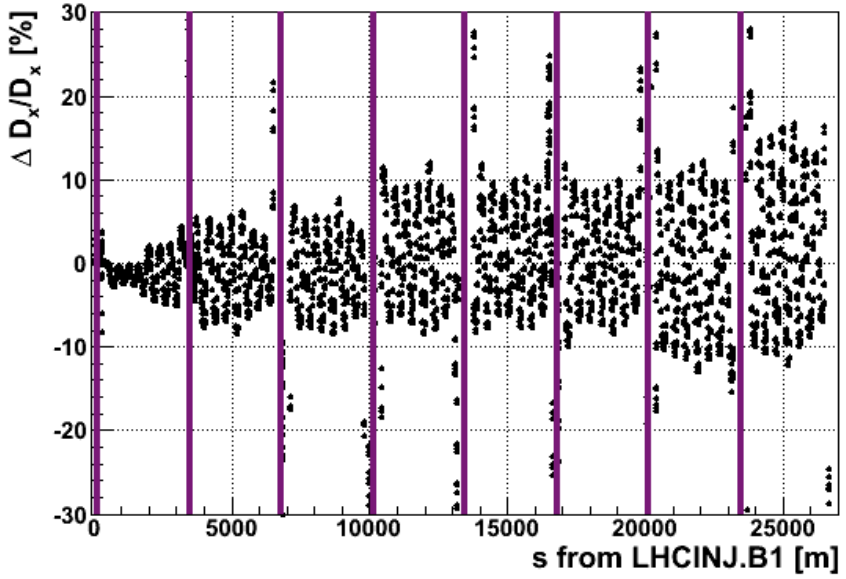

ARC 4→5
$\Delta D_x/D_x$ [%]
s from LHCINJ.B1 [m]

ALL RING 1

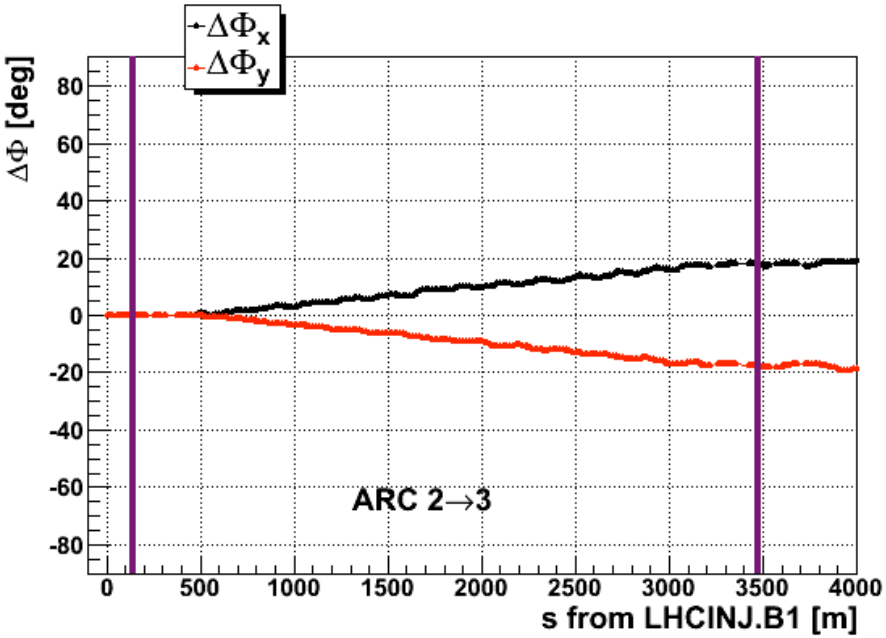

β_x nominal
β_x with b2 in MBs
β_x [m]
s from LHCINJ.B1 [m]

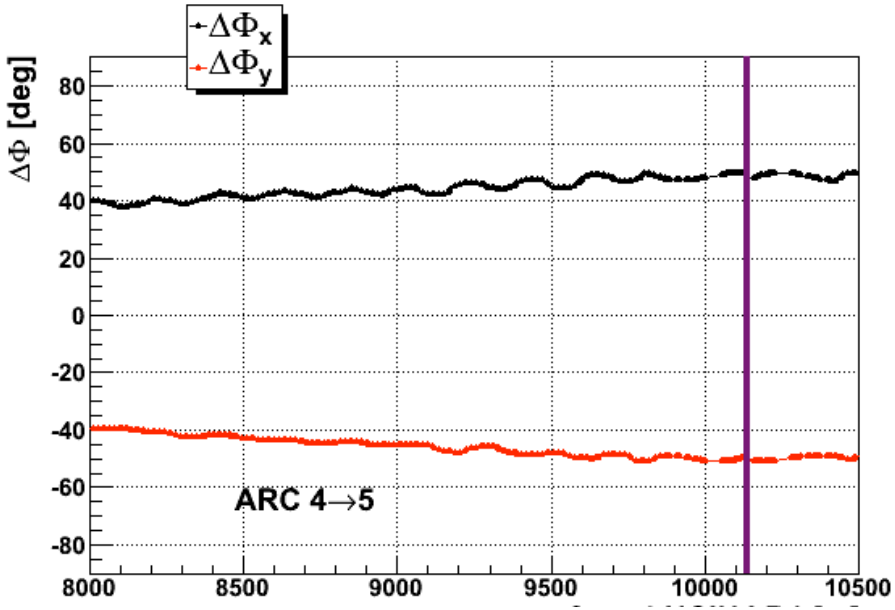

D_x nominal
D_x with b2 in MBs
D_x [m]
s from LHCINJ.B1 [m]

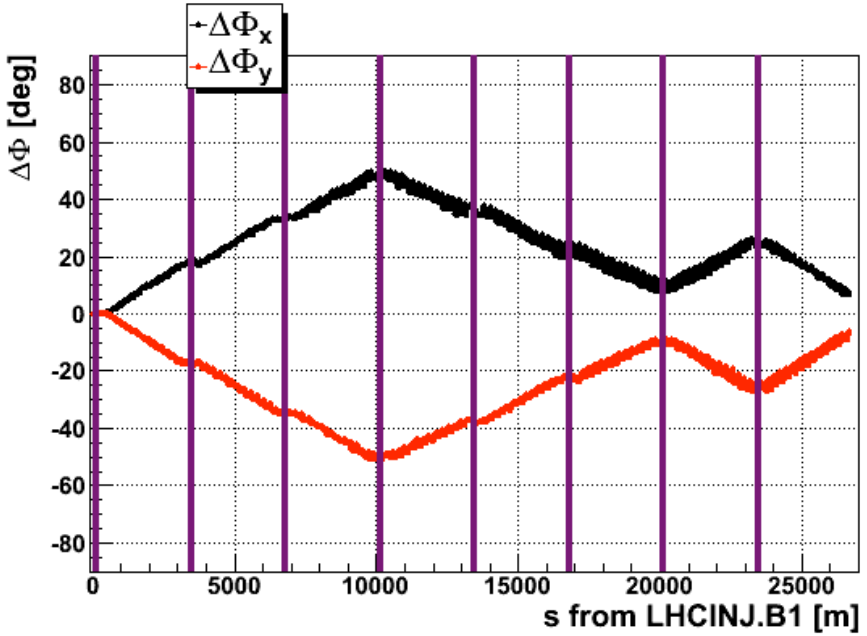

$\Delta\beta_x$
$\Delta\beta_y$
$\Delta\beta/\beta$ [%]
s from LHCINJ.B1 [m]


$\Delta D_x/D_x$ [%]
s from LHCINJ.B1 [m]

PHASE ADVANCE

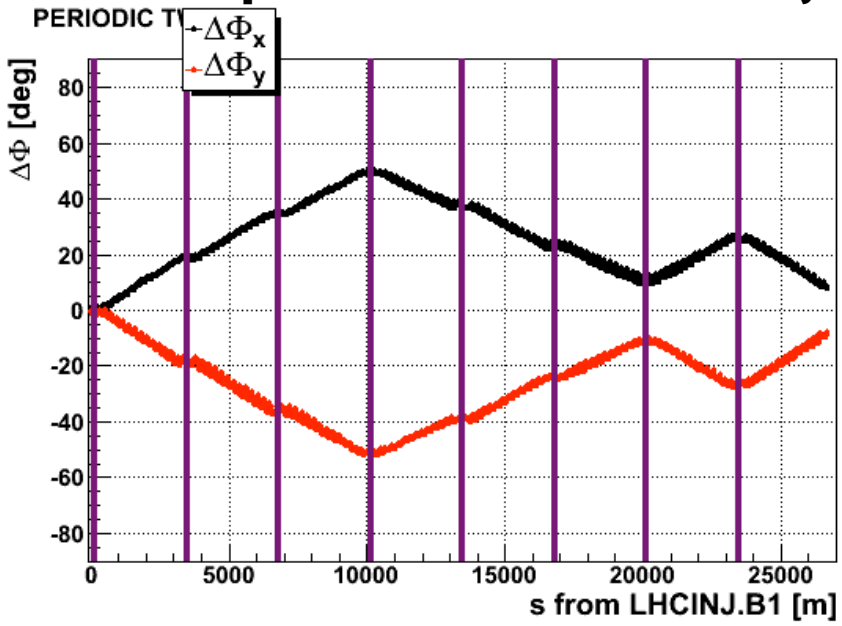




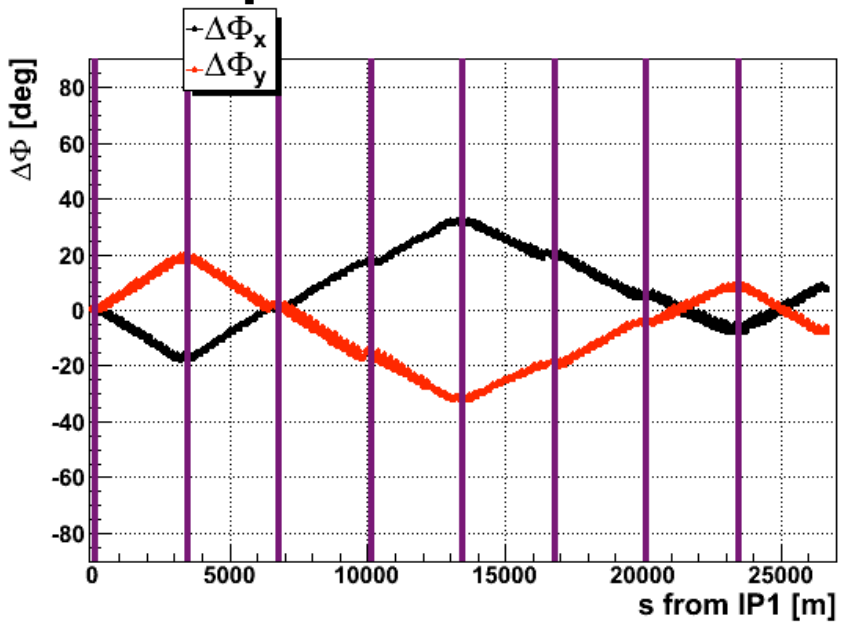


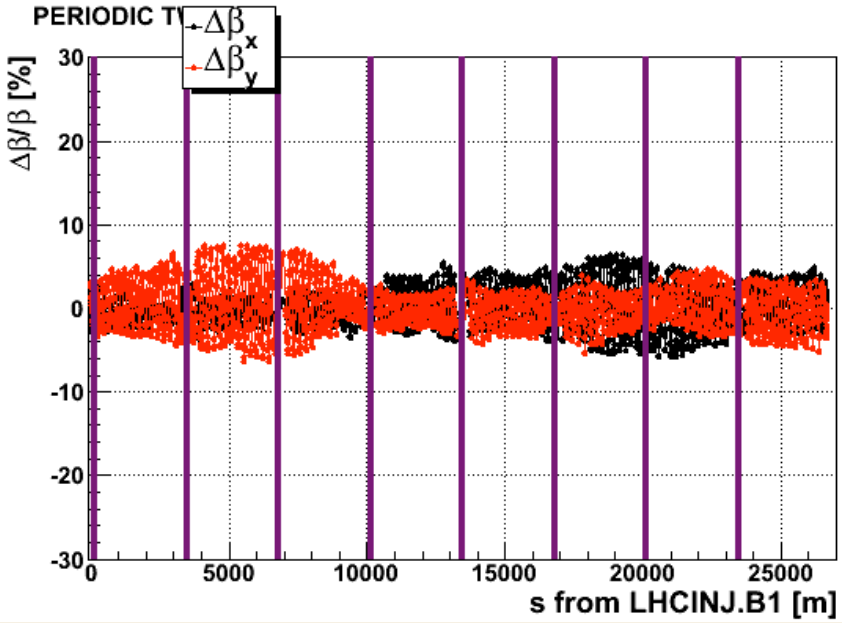
Periodic Twiss

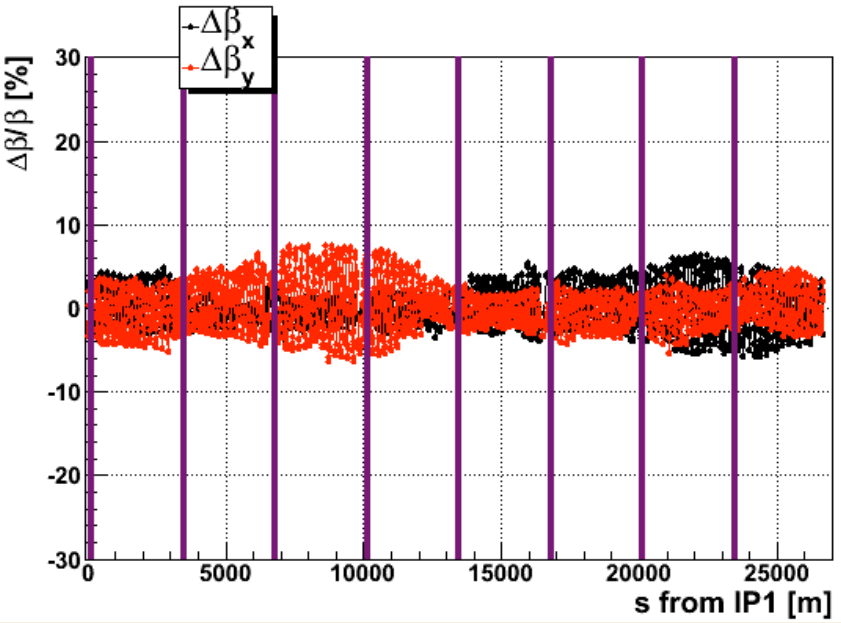
Sequence starts at LHC inj



Sequence starts at IP1







Summary

- Presented here: only b2 errors from dipoles

  results in terms of beta-beat look consistent with prediction (don't they?)

- Next:

  --check w.r.t. thin lens with errors

  --check w.r.t. declaring k1 in madx dipole definition

  --check resulting tune variations

  --expand model including all errors, corrections, tune and chromaticity matching etc...

  --integration into MADX OM