DA with b3 errors in D2

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General context

- Recent measurement results of the D2 field quality show that for most of the magnet, the b_3 is stronger than anticipated for the performance criteria.
- Studies have been conducted to check the impact of the increased b_{3S} and to improve the nonlinear correction of the field quality of D2.
- Three configurations have been considered where the increased b_{3S} is applied to:
  - all four D2 in the ring.
  - one D2 in IR1.
  - one D2 in IR5.

Round Optics (v1.4)

$Q_x = 62.31$	$Q_y = 60.32$
$Q' = 3$	$I_{MO} = 0\,A$
$\frac{1}{2}\theta_c^{1,5} = 250\,\mu rad$	$d_{sep}^{1,5} = \pm 0.75\,mm$
$\beta_{1,5}^* = 0.15\,m$	$\beta_2^* = 10\,m$
$\beta_8^* = 1.5\,m$	$E = 7000\,GeV$
$\epsilon_n = 2.5\,\mu m$	

- Initial D2 field quality:
  - $b_{3S} = 1.000;$
  - $b_{3M} = b_{3U} = 1.667;$
- Scan in b_{3S}:

$$[-6, -3, -1, 0, +1, +3, +6]$$

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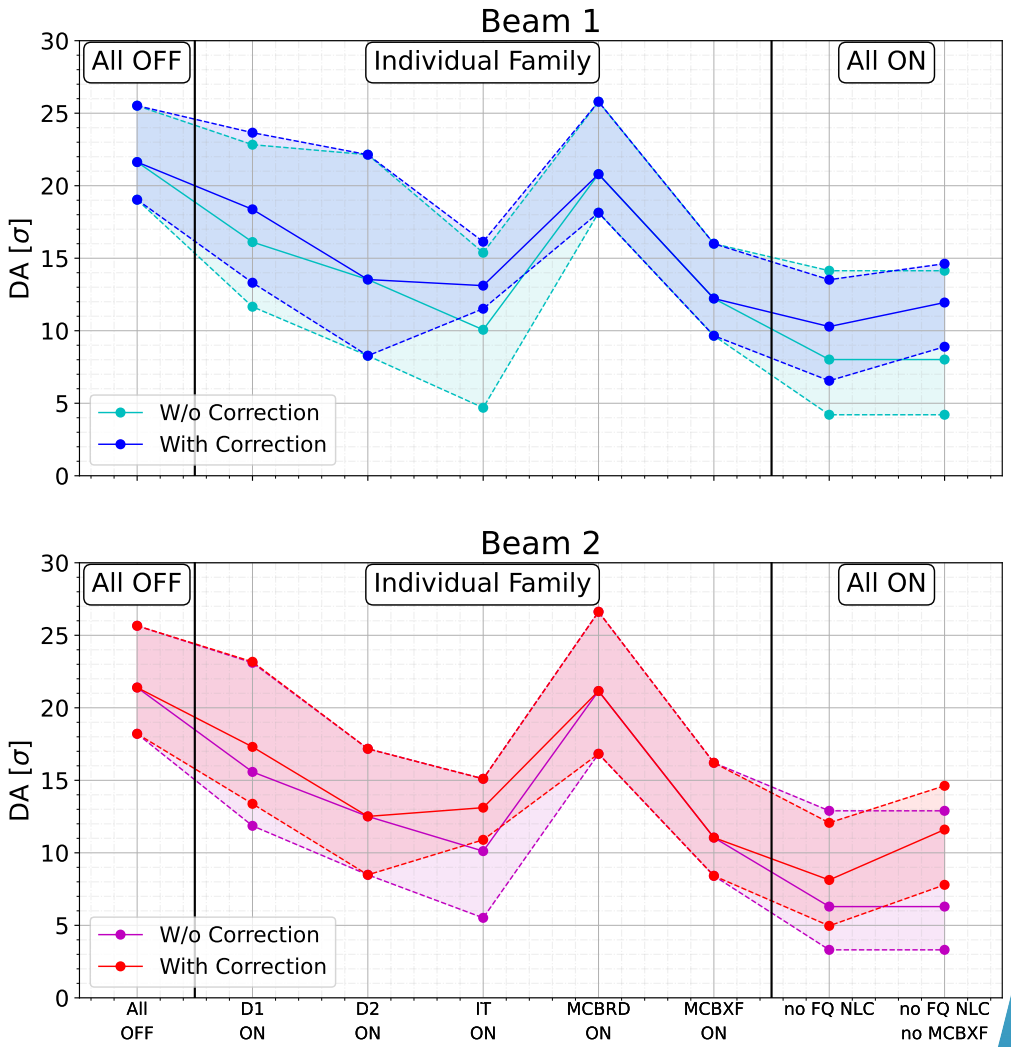
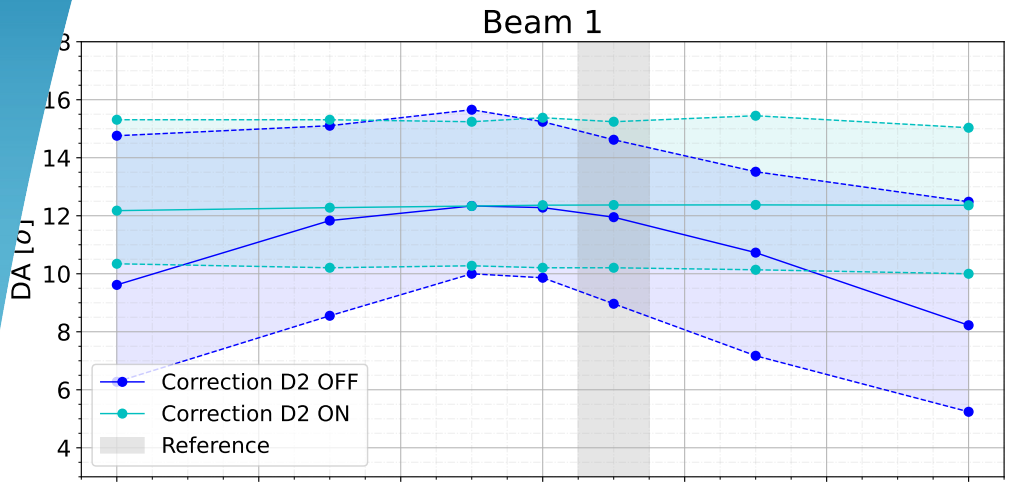
DA vs FQ of IR magnets

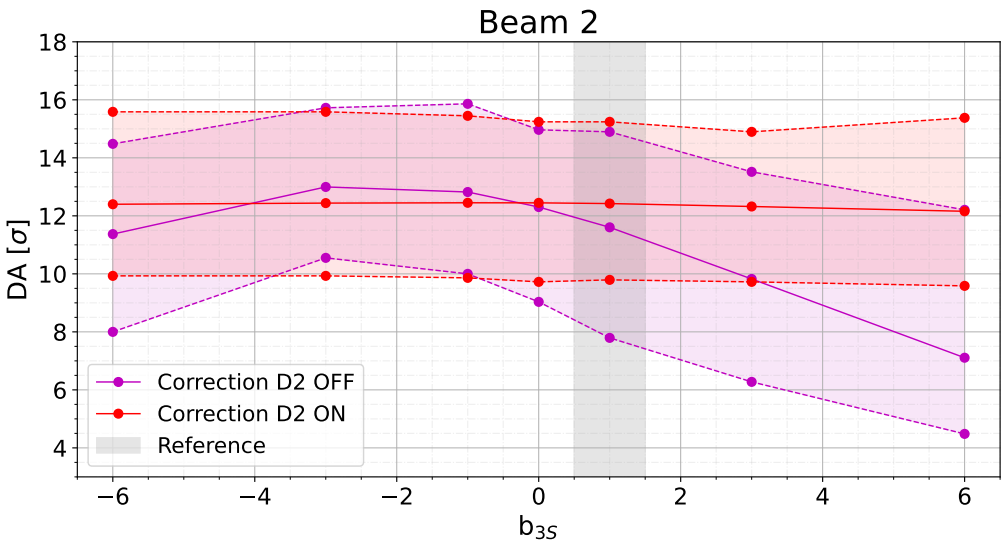
D2s, Inner Triplets, and MCBXFs are the main sources of limitation for the DA.

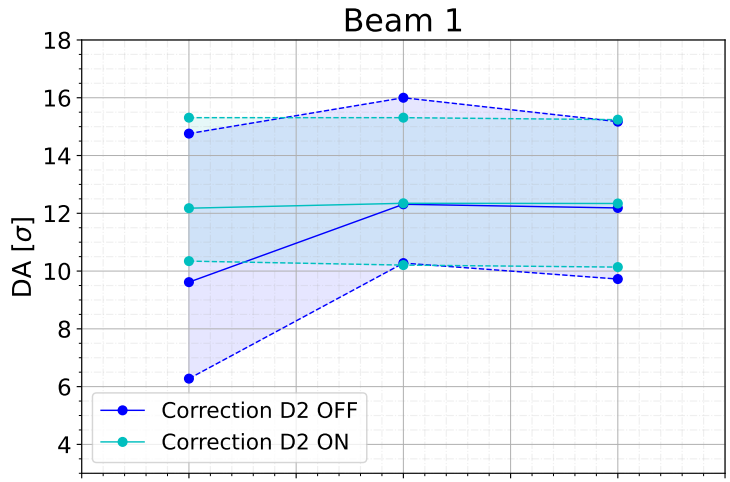
Correction of D2 FQ using the CP magnets is not enabled by default in our simulations. The current procedure only corrects for the average field between the D2 apertures.

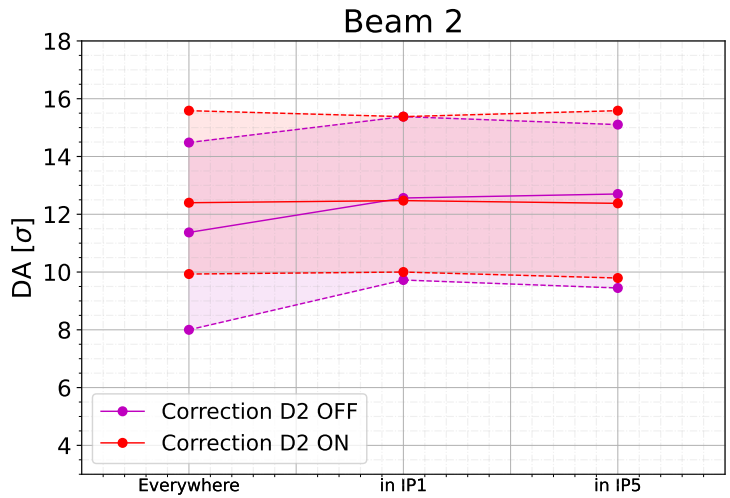


Scan in b_{3S} and a single bad D2









Position of D2 with

$b_{3S} = -6$

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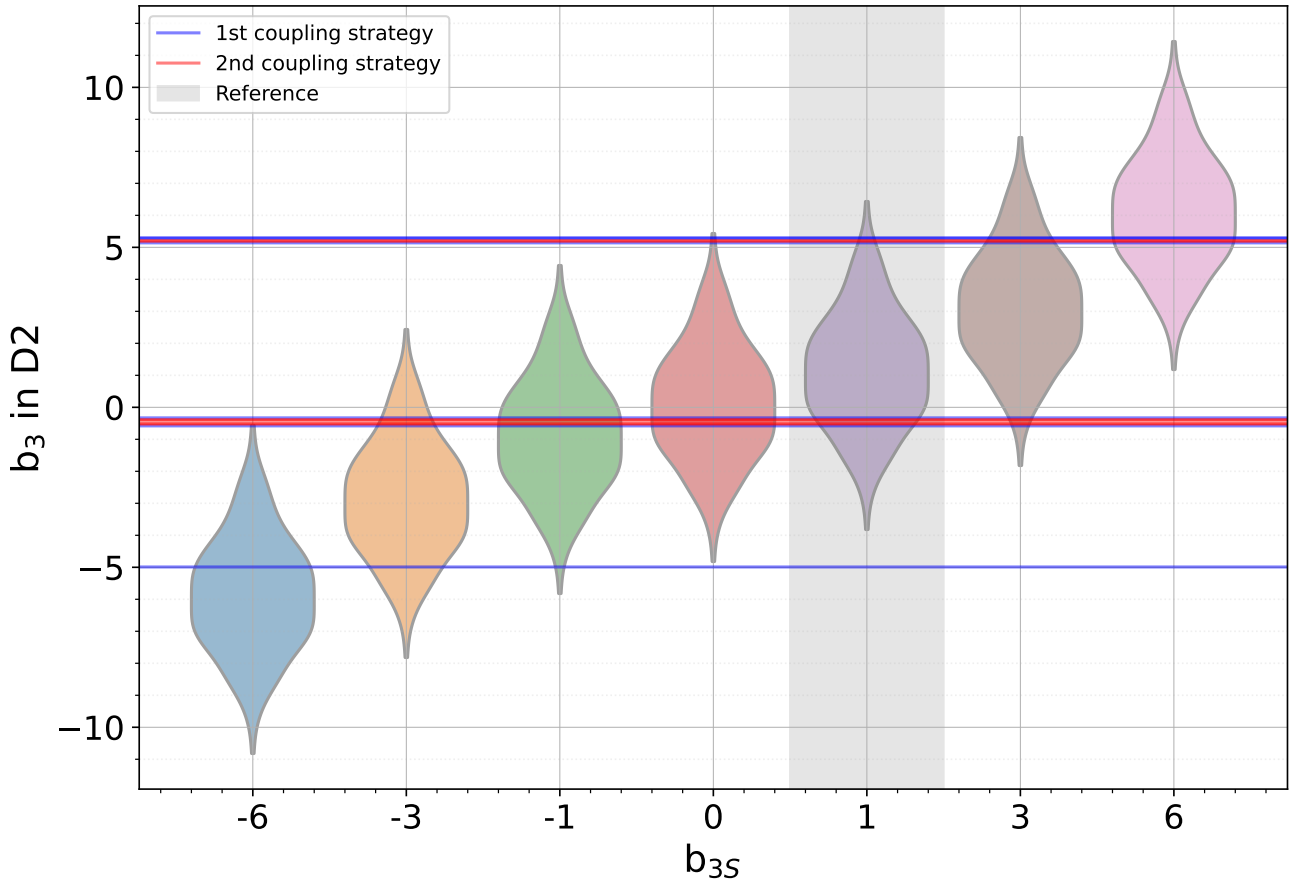
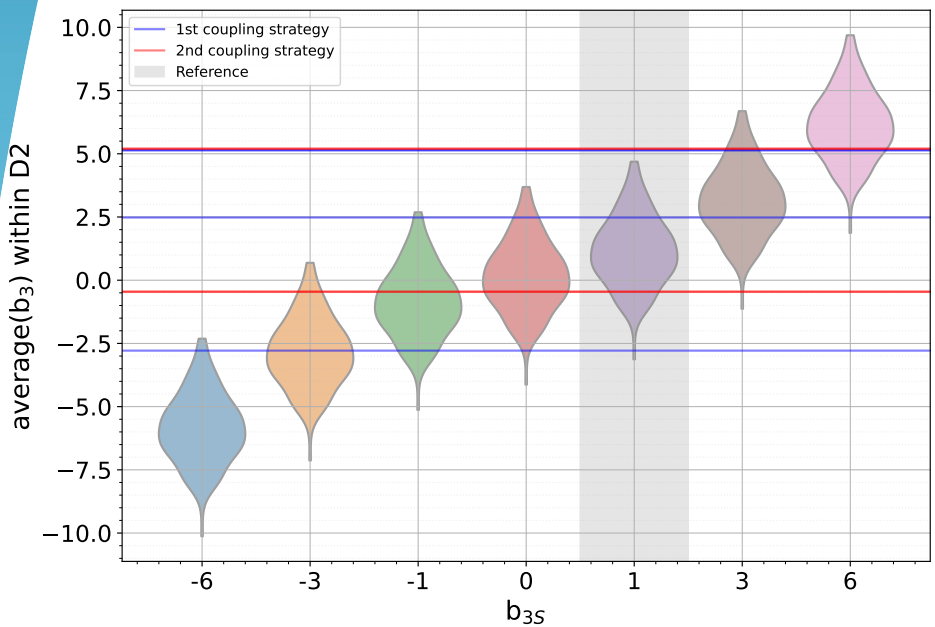
b_3 in D2 (Scan and now)



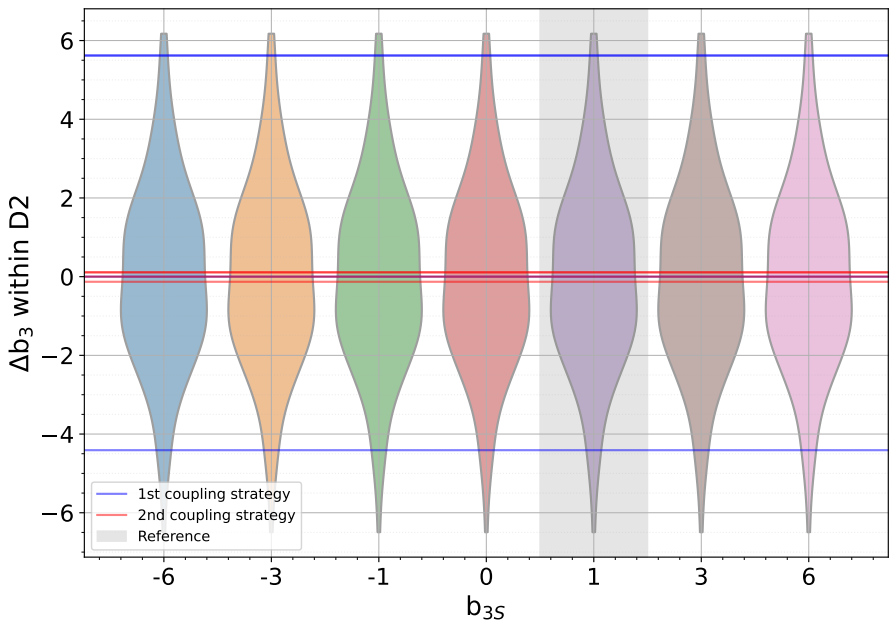
The 1st coupling strategy seems similar to the worst-case scenario of the case with $b_{3S} = 0$.
For the 2nd coupling strategy, we are closer to a scenario with $b_{3S} = 1 - 3$.

average b_3 and Δb_3 within D2

Average b_3 between aperture



Δb_3 between aperture



- The spread of average b_3 between the two D2 apertures is outside what was previously simulated.
- The spread of Δb_3 between the two D2 apertures is inside what was previously simulated.

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Conclusions

- Due to the new OS in lxplus, SixDesk routines and BOINC cannot be used! Xdyna, which was developed to replace them and use Xtrack, has a bug when running in parallel with HTCONDOR (debugging in progress)!

- To solve this Xdyna is running on the optics and dev server and the parallelisation is managed manually. 1 out of 4 DA simulations has finished

- So far, DA simulations can't be run in until Xdyna is fixed.

- Based on previous studies, both coupling scenarios seems acceptable (to be confirmed with DA simulations).

Thank you very much!

Extra: 1st plots definition

- **All OFF:**

  For this simulation, all LHC magnetic errors are included, but the HL-LHC magnetic errors are switched OFF.

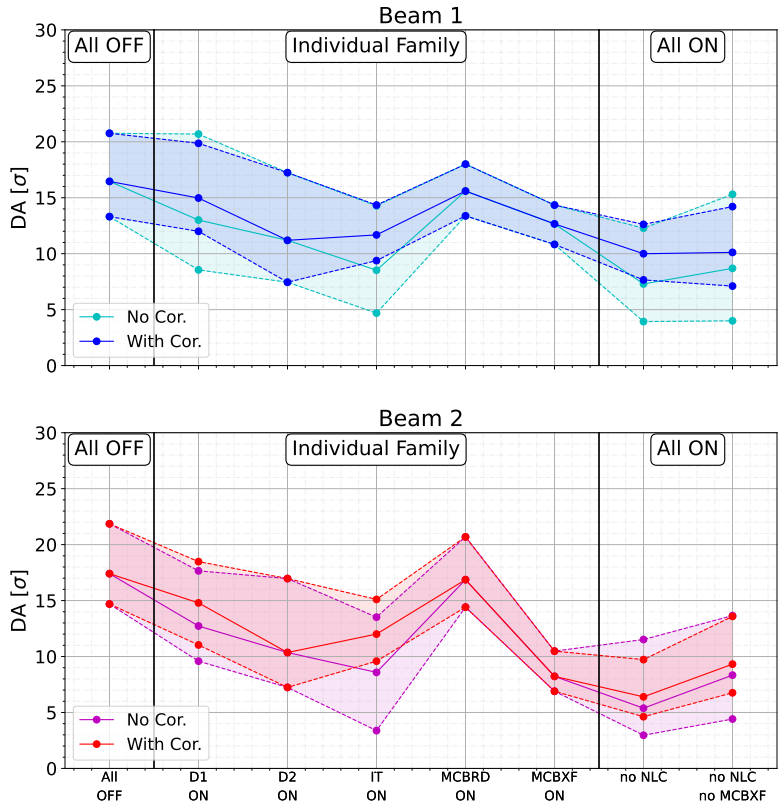
- **Individual Family:**

  For these simulations, all LHC magnetic errors are included, and the errors of one HL-LHC magnet family are included each time.

- **All ON:**

  For these simulations, all LHC and HL-LHC magnetic errors are switched ON except:

  - **no NLC:** NLC magnetic errors are switched OFF
  - **no NLC no MCBXF:** NLC and MCBXF errors are switched OFF



- **No Cor.:** Correction of the field quality of IT and D1 is switched OFF.
- **With Cor.:** Correction of the field quality of IT and D1 is switched ON.