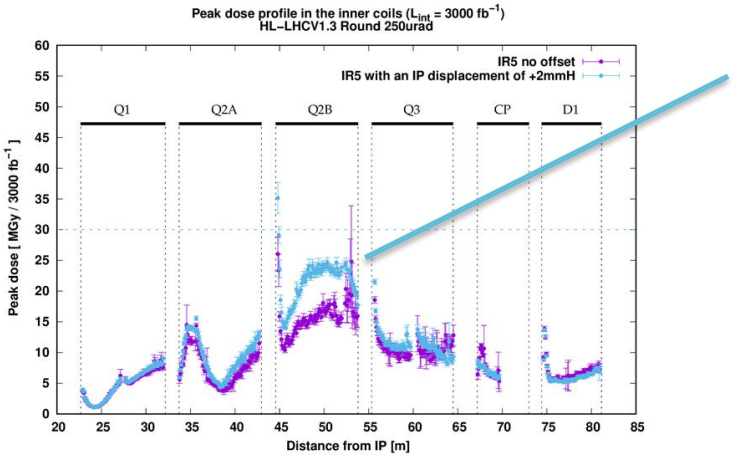
Possible triplet shift

R. De Maria

Motivation

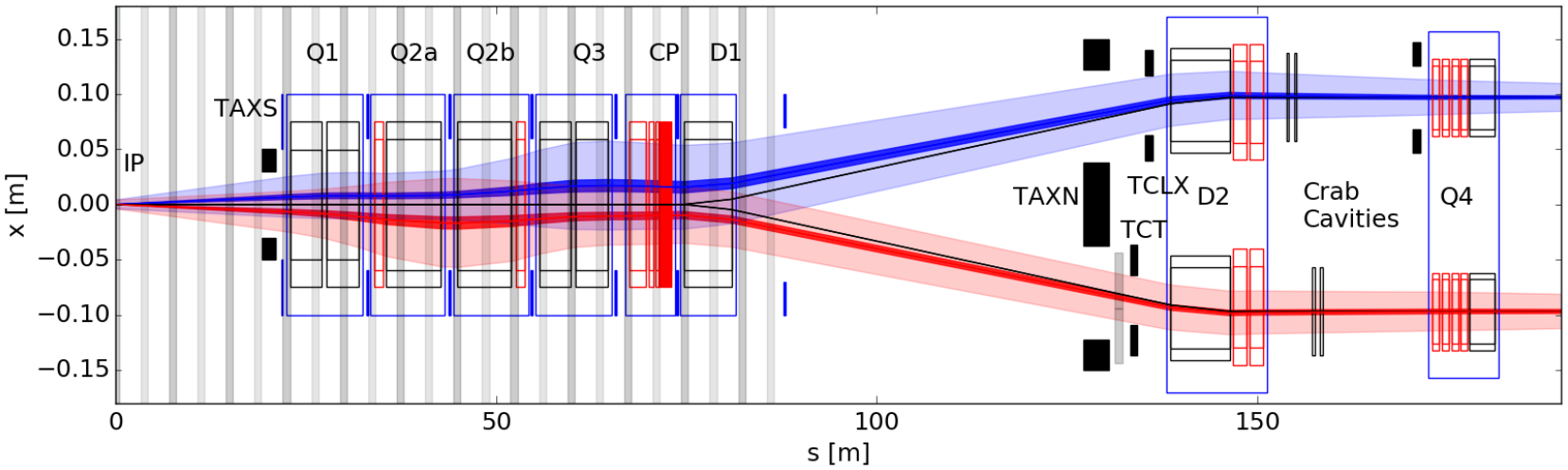
F. Certutti and M. Sabbate: an offset of triplet in the direction of the outgoing beam in the crossing plane is beneficial in terms of accumulated dose.



Opposite case has a detrimental effect. The good offset is under study and to be presented.

Can we still apply a voluntary displacement at IP after the full remote alignment optimization that reduced the number of orbit correctors?

Aperture general features

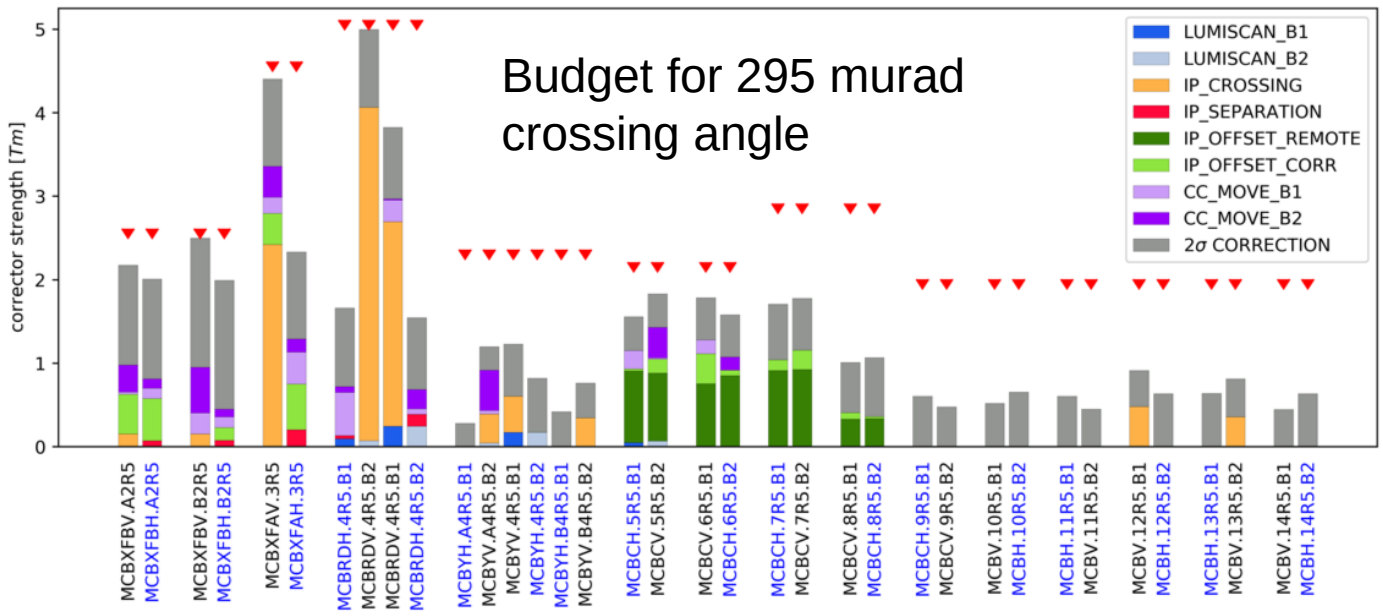


When the triplet are shifted w.r.t. the IP:

1) feeddown effects strongly perturb the orbit that needs to be corrected
- limits due to orbit leakage in the crab cavities (hard limit)
- limits in orbit corrector strength (hard limit)

2) aperture may reduce:
- use margins or recover by increasing beta* (soft limit)

Orbit corrector budget



Not much margin for additional orbit manipulation.

IP shift study performed for nominal 250 murad and using the following budget for both crossing and pi shift.

It compromise slightly orbit correction leakage.

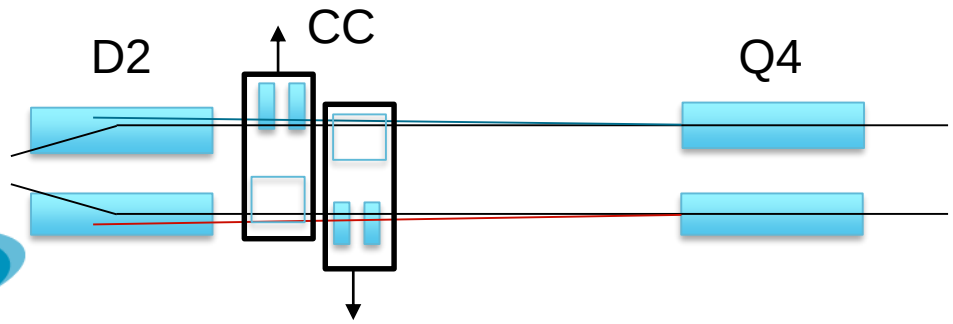
Family	Budget
MCBXFA	0.5 Tm
MCBXFB	3.0 Tm
MCBRD	4.5 Tm
MCBY(s)	2.25 Tm
MCBC	2.1 Tm

Results for 250 murad and beta*=15cm

Triplet shift [mm]	Orbit at CC [mm]	δ Separation at CC [mm]	Triplet aperture [σ]
0	0	0	13.1
0.7	<1	<0.1	12.8
0.9	<2	<0.8	12.6
1.1	<3	<1.7	12.5
1.3	<4	<2.6	12.3
1.5	<5	<3.5	12.2

Limits are in MCBX, MCBRD, MCBY.

- Vertical and horizontal crossing are similar.
- Since CC needs to be centered w.r.t. the closed orbit, the cryomodule needs to be displaced (issue bellows and aperture of by pass b.s).



Conclusion

- Still possible to impose a triplet offset to mitigate radiation up to 1.5 mm with compromises:
  - It complicates the alignment of the cryomodule:
    - Rely in full range RF deformable bridge
    - Require large transverse offset w.r.t to the ideal alignment line
- In the horizontal plane (for which one cannot apply the flip of crossing sign), D1 and D2 can be used together with the MCBRD, MCBY to mitigate the issue at the crab cavities.