## INFN

# Iteration on length of high order correctors 

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## LAYOUT

- Iteration on the corrector strength is needed
- Summary of strength used in the baseline

| Multipole | Intgrated gradient <br> $(\mathrm{T} \mathrm{m})$ | (units) | Magnet length <br> $(\mathrm{m})$ |
| :---: | :---: | :---: | :---: |
| $\mathrm{a}_{2}$ | 1.000 | 50 | 0.841 |
| $\mathrm{a}_{3}, \mathrm{~b}_{3}$ | 0.063 | 3 | 0.123 |
| $\mathrm{a}_{4}, \mathrm{~b}_{4}$ | 0.046 | 2.2 | 0.990 |
| $\mathrm{a}_{5}, \mathrm{~b}_{5}$ | 0.025 | 1.7 | 0.107 |
| $\mathrm{~b}_{6}$ | 0.086 | 3.2 | 0.449 |
| $\mathrm{a}_{6}$ | 0.017 | 0.8 | 0.102 |

- Larger $\mathrm{a}_{4}, \mathrm{~b}_{5}, \mathrm{M}$. Giovannozzi team shows that we are at $87 \%$ of the nominal force for order 4 and 5
- Best estimates of field quality are based on 3 short models
- We see large values of a4 and b5 about 2-3 times larger than our tables
- We shoud act now - no time to have ore data from long models


## LAYOUT

- Explored possibilities
- https://indico.cern.ch/event/707076/ (February 2018)
- $50 \%$ more current to get $30 \%$ more strength
- Viable, but does not look as best option: much lower margin, and limited effect
- $30 \%$ more length to get $50 \%$ more strength
- Protection ok, 320 mm more in the cold mass if we also increase order 3
- Decision by April, call for tender for series is being prepared (contract to be signed in January 2019)
- Impact on costs is less than 5\%, for the moment in the noise


## LAYOUT

- Where to find the 320 mm ?
- 120 mm found from optimization of the lay-out
- Option of a shorter skew quadrupole
- 200 mm less in the skew quad would mean correcting 35 units instead of 50
- Iteration on the strength of the skew corrector is ongoing (WP2)
- Today in the LHC we can correct up to 39 units, and we use the magnets at $40 \%$ of maximum current (we correct 16 units)
- Decision to be taken soon (April): Lasa is writing the invitation to tender



## A FURTHER POSSIBLE DEVELOPMENT

- The dependence on the current is highly non linear due to saturation
- If we could work with 25 units correction (half of the strength of what we have today) this would open to door to have 120 A circuits, and no dump

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