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 (T m)	(units)	Magnet length (m)
a_2	1.000	50	0.841
a_3, b_3	0.063	3	0.123
a_4, b_4	0.046	2.2	0.990
a_5, b_5	0.025	1.7	0.107
b_6	0.086	3.2	0.449
a_6	0.017	0.8	0.102

- Larger a_4, b_5, 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

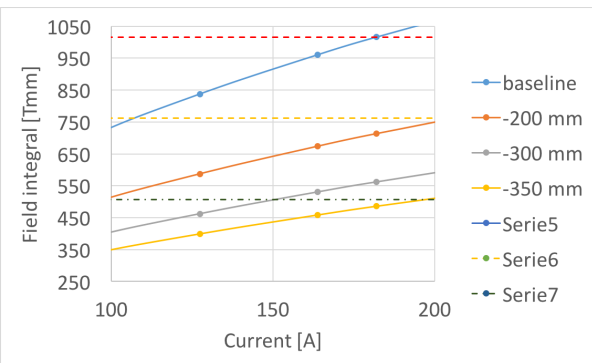- We shoud act now – no time to have ore data from long models

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

Corrector strength	(units at 17 mm) LHC	(units at 23 mm) LHC	(units at 50 mm) HL-LHC
a_2	39	39	50
b_3	1.1	1.5	3.0
a_3	1.8	2.5	3.0
a_4, b_4	0.8	1.5	2.2
a_5, b_5	-		1.7
b_6	0.8	2.8	3.2
a_6	-		0.8

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