



FUTURE
CIRCULAR
COLLIDER

5th FCC-hh design meeting

Thursday 13th July 2023, 14:00 – 15:00

Chair: Massimo Giovannozzi

Speakers: Massimo Giovannozzi, Ezio Todesco

Participants: Andrey Abramov, Wolfgang Bartmann, Roderik Bruce, Massimo Giovannozzi, Patrick Krkotic, Gustavo Pérez Segurana, Ezio Todesco

Apologies:

AGENDA

Overview of recent activities (Massimo Giovannozzi)	1
Considerations on superconducting D1/D2 dipoles for FCC-hh experimental insertions (Ezio Todesco)	1

OVERVIEW OF RECENT ACTIVITIES (MASSIMO GIOVANNOZZI)

Minutes from previous meetings were approved without comment.

CONSIDERATIONS ON SUPERCONDUCTING D1/D2 DIPOLES FOR FCC-HH EXPERIMENTAL INSERTIONS (EZIO TODESCO)

The requirements of the D1 and D2 dipoles in terms of the integrated field is 160 Tm. For LHC, this value is 28 Tm and for HL-LHC it is 35 Tm. For the 80 TeV baseline, the integrated field is 128 Tm. With regards

to the aperture, D1 will have an aperture of 116 mm, between the LHC (80 mm) and HL-LHC (150 mm). for the D2, the aperture will be 80 mm, same as LHC, and smaller than HL-LHC (105 mm).

Different options are presented for the D1, beginning with Nb-Ti at 1.9 K, like the HL-LHC D1 (5.6 T). The second option is a double-layer Nb-Ti reaching 7 T. Third, Nb3Sn like Fresca2, reaching 13 T.

For the D2, two options are available. First is like the HL-LHC D2 (Nb-Ti, 5 T) with the limiting factor being field quality driven by crosstalk. Second, a magnet like the LHC MB (7 T).

D1			
Inspiring magnet	Field (T)	Lenght for 100 TeV (m)	Lenght for 80 TeV (m)
á la HL-LHC D1	5.6	2×14.3	2×11.6
á la LHC MB	7.0	2×11.5	2×9.3
á la Fresca2	13.0	12.3	10.0

D2			
Inspiring magnet	Field (T)	Lenght for 100 TeV (m)	Lenght for 80 TeV (m)
á la HL-LHC D2	5	3×10.7	2×13
á la LHC MB	7.0	2×11.3	2×9.3

Massimo asks which is the favoured option from the magnet design point of view. From the optics standpoint, higher fields occupying less space provide greater flexibility. Additionally, it is Important to increase field in D1 to lower the impact of beam-beam effects.

It is decided to move forward considering 13 T D1 and 5 T D2. With stronger D1, D2 moves towards the IP to maintain the same beam separation. Therefore, a check of the apertures for D2 will be required.

Massimo asks how it would be best to handle the possibility of reaching 20 T for the main dipoles. **Ezio** answers that it would be preferable to work with 80 TeV baseline to have a coherent machine. From there we can assume that scaling to 20 T in main dipole field can be applied to the rest of superconducting magnets.

Minutes reported by Gustavo Pérez Segurana