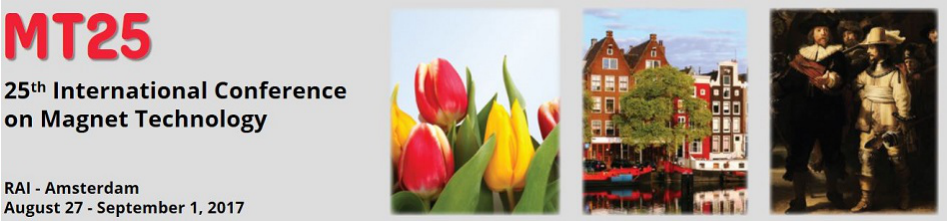

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Detailed magnetic and mechanical design of the nested orbit correctors for HL-LHC

Monday, 28 August 2017 11:15 (15 minutes)

Nested orbit correctors magnets so-called MCBXF are needed for the upgrade of the LHC, in the framework of the HL-LHC project. There are two versions (A and B), with different physical lengths, respectively, 2.5 and 1.5 m, which share the same cross section to decrease the fabrication cost. These magnets have a large aperture of 150 mm. Due to the high radiation dose, a mechanical clamping is necessary to hold the large torque between both dipoles.
Magnetic and mechanical conceptual design is described elsewhere. This paper describes the final magnetic design, with special attention to 3-D electromagnetic calculations and the different operation scenarios. It also includes the results of a number of mechanical FEM models, which analyze the stress distribution and deformations at several load steps: assembly, cooling-down and energization. Finally, a mechanical model has been designed, fabricated and tested to show the feasibility of the proposed clamping structure. This paper also describes other tests performed to improve the accuracy of the FEM models, such as the measurement of the Young modulus of stacks of impregnated cables.
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