

Design study of the mechanical structure for the SIS300 superconducting dipoles

S.Farinon, P.Fabbricatore, R.Musenich, F. Alessandria, G.Bellomo, M.Sorbi,
G.Volpini, U.Gambardella, R.Marabotto

- (1) INFN Sezione di Genova , Via Dodecaneso 33, I-16146 Genova, I
- (2) INFN Sezione di Milano LASA, Via Fratelli Cervi Milano I
- (3) INFN Laboratori di Frascati Via E.Fermi Frascati, I
- (5) ASG Superconductors, Corso Perrone Genova, I

One of the most challenging components of the FAIR facility, under development at GSI, is the dipole of the synchrotron SIS300 (300 Tm rigidity). This magnet is designed for generating 4.5 T in a bore of 100 mm, able to be operated at a field rate of 1 T/s. The magnetic length is 7.8 m with a curvature radius of 66.67 m (the sagitta is 114 mm). The design of the mechanical structure of this cos-theta shaped dipole is particularly critical, due to the fatigue problems ensuing from the large operating field rate over a large lifetime cycle number, 10^7 . The adopted solution is based on 3 mm laminated stainless steel collars, assembled through keys, coupled with 1 mm laminated iron shells, assembled through large C-shaped clamps. A 2D finite element analysis has been performed to evaluate stresses and deformations coming out during assembly, cool-down and energization.