

# Characterization of Low – Carbon Steel for High – Field Accelerator Magnets

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In the quest of higher field accelerator superconducting magnets, an essential part of their design is the so called yoke, which is traditionally made of low – carbon magnetic steel fine – blanked laminations. The material's choice is made based on a compromise between the high saturation field, providing a return path for the magnetic flux, and the mechanical robustness conferred to the magnets' cold masses. This presentation describes the mechanical characterization of low – carbon steel, and applies several approaches for the design and the validation of the material from the structural point of view. Tensile tests at room and cryogenic temperature, together with fatigue and fracture toughness at cryogenic temperature has been performed, and calculations based on the obtained material properties implemented in order to ascertain the structural limits of low – carbon steel for its use in the fabrication of high field accelerator superconducting magnets.