

Mechanical Limitation of Stack Type Coated Conductor Cables for Magnet Applications

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Abstract—The critical surface of the *ReBCO* superconductor enables magnets featuring 20 T + in the future when mechanical issues can be overcome. When designing a high-field magnet of significant size, a cabled conductor needs to be used, due to current magnitude, required current sharing and limitation of self-inductance of the magnet to achieve acceptable ramp time and quench protection. There are few concepts of coated conductor cables existing as Roebel, CORC and stack type of cable. Currently the Roebel Assembled Coated Conductor cable is on standby, and only a few scientific works have been published. CORC, Cable on Round Core in a few variations are being further developed for various applications. Currently, the most widely researched conductor is stack cable, primarily motivated and researched for fusion magnet applications.

Since stack type (sub-)cable is the one currently intensively explored, in this presentation the present understanding of the mechanical properties and constraints of stack (sub-)cables for magnet applications will be summarized. Effects of the various components of Lorentz force, considering different magnet geometries, are discussed. An overview of experimental and theoretical aspects to understand mechanical questions so far published in literature on stack coated conductor cables is given. Finally, the eventual mechanical limitations of the technology for future high-field magnets will be highlighted.

Keywords (Index Terms)—Coated conductors, HTS cable, HTS magnet