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## Magneto-Mechanical Optimization of Cross-sections for $\cos \theta$ Accelerator Magnets

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The cross-section design of  $\cos \theta$  superconducting magnets is historically developed in a two-step process: initially, the coil geometry is defined on the basis of magnetic optimizations; then, the structure is designed around the coil. The first step searches for the best coil cross-section maximizing the magnetic field, margin, field quality and conductor efficiency. The latter step aims at limiting the coil stresses and deformations. However, the coil design, defined with the initial magnetic optimization, can influence the mechanical behavior of the magnet, altering, for example, the peak stress during operation. As the critical current is a function of the applied strain, the mechanical implications of the coil cross-section design can limit the achievable performance. In this paper we propose an integrated optimization process that targets the peak stress on the conductor in addition to the magnetic objectives. The results are presented for two sample  $\cos \theta$  dipoles: a 2 layer and a 4 layer Nb<sub>3</sub>Sn magnet design aiming at ultimate conductor performance.

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