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## Design of a double aperture Canted-cosine-theta orbit corrector for the High Luminosity LHC

### Content

The High Luminosity LHC requires dipole orbit correctors grouped in double aperture magnet assemblies. They provide a field of 3.1 T at 100 A in an aperture of 70 mm. The current standard design is a classical cosine-theta layout made with ribbon cable. However, the electric insulation of the ribbon cable is however not radiation-resistant enough to withstand the radiation load expected in the coming years of LHC operation. A new design is needed based on a radiation-resistant polyimide insulated cable that can replace the existing orbit correctors when they reach their end-of-life due to radiation damage. The challenge is to design a magnet that simply plugs into the existing positions and re-uses bus-bars, passive quench protection, and power supplies. We propose a self-protected canted-cosine-theta (CCT) design. We take the opportunity to explore new concepts for the CCT design to produce a cost-effective and high-quality design with a more sustainable use of resources. The new orbit corrector's design must fit with tight field quality requirements while keeping within the same mechanical volume and maximum excitation current.

A collaboration of Swedish universities, Swedish industry, and CERN has started to develop a prototype following concurrent engineering (CE) methodology to reduce the time needed to deploy functional CCT magnet. The magnet will have a 1m long CCT dipole layout consisting of two coils. The superconductor is a commercially available 0.33mm strand with polyimide insulation in 6-around-1 cabling. The channels in the coil formers, that determine the CCT layout, allow for 2x5 cable-layers. A total of 70 windings makes that the coil current can be kept below 100 A. We will present the detailed design and quench simulations.

### Country

Sweden

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