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Conception design of a magnetic flux lens using stacked HTS tapes

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A magnetic flux lens (MFL) exploits the induced screening current during an in-situ zero field cooling magnetization process to enhance the local flux density. It is a passive device being equivalent to an inner coil of a hybrid magnet. However, it requires no power supply and quench protection.
The magnetic flux lens has been first realized by using bulk HTS superconductors, and been recently extended to a novel hybrid magnet combining both trapped field magnets and magnetic flux lens. However, the flux instability and the limited mechanical strength of such a device restricted its high-field application. In this work, we demonstrate the design of a flux lens using stacked HTS tapes for high-field magnet. The numerical simulation shows that the stacked-tape MFL can perform effectively to enhance the central field by 50 % under magnetic field lower than 10 T, and by more than 10 % under field higher than 20 T which is still considerable. Further improvements can be realized by optimizing the design of the MFL. We will also show the results of our preliminary tests of a stacked MFL to verify the numerical simulation.

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