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AC loss analysis of the armature windings of a fully HTS rotating machine with dual field windings

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Although the high temperature superconducting (HTS) synchronous motors or generators has been proposed by lots of research groups, just a small number of them has been proposed a fully superconducting rotating machines with HTS conductors. One major reason for that will be AC loss problem caused by the alternating magnetic field applied to the armature windings. However, a fully HTS rotating machine is to be required to achieve higher electrical capacity for application of wind power generation and so on. We believed that a dually arranged HTS field windings could be the solution of the AC loss problem and suggested a design of a fully HTS synchronous rotating machine with dual field windings. In this paper, the AC loss analysis will be performed for the similar type fully HTS rotating machine. The dually arranged field winding will help to reduce the magnetic field perpendicularly applied to the wide surface of the HTS conductors of the armature winding. As a result, it will not only reduce the AC loss from the armature windings but also increase the critical current of the HTS conductors in it. The results of the analyses will be compared with a conventional synchronous rotating machines.

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