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Tue-Mo-Po2.11-11 [97]: Investigation of High Temperature Superconducting Flux-Switching Motors with Different Secondary Structures

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Compared with Linear Induction Motor (LIM) which is widely applied in urban railway transit system, Linear Flux-Switching Motor (LFSM) has the merits of high power density, high efficiency, while the secondary of LFSM is robust and simple. Hence, LFSM is claimed to be promising for urban railway transit system.
Generally, LFSPM can be classified as Linear Wound Field Flux-Switching (LWFFS) motor and Linear Flux-Switching Permanent Magnet (LFSPM) motor. Researches show that LFSPM motor has high efficiency and power factor while the speed range and reliability is limited due to the Permanent Magnets (PM). For LWFFS motor, the speed range is wide while the power density and efficiency are influenced by the field windings.
To cooperate the merits of high power density and wide speed range, it is feasible to adopt High Temperature Superconductor (HTS) windings as field windings. But so far, the researches of HTS LFSM are limited to the design, optimization and analysis of one certain kind of HTS LFSM. It remains unknown whether the conclusions about typical LWFFS motor also apply to the HTS LFSM whose current density is extremely high. And it also lacks investigation about the strength and weakness of different topologies of HTS LFSMs. Therefore, the aim of this paper is to investigate the performance of HTS LFSPMs of different secondary structure and pole pitch ratio between primary and secondary.
In this paper, the topologies and working principles of HTS LFSMs with slotted secondary and segmented secondary will be introduced first. Second, slotted HTS LFSMs of different primary and secondary pole pitch ratios will be optimized and compared with other to obtain a finest slotted HTS LFSM. Third, segmented HTS LFSMs of different primary and secondary ratios also be optimized and compared with other so that a finest segmented HTS LFSM can be obtained. In the end, the HTS LFSMs of different secondary structures will be compared under different working conditions to investigate their performance for railway transit system.

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