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## METHOD FOR CALCULATION OF NO-LOAD BACK EMF OF HIGH VOLTAGE LINE-START PERMANENT MAGNET SYNCHRONOUS MOTOR

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### Abstract

*When the finite element method is used to calculate the no-load back EMF of the high voltage line-start permanent magnet synchronous motor (HV-LS-PMSM), choosing the actual length and effective length of the stator core will cause different calculation results. In order to accurately calculate the no-load back EMF of HV-LS-PMSM with ventilation ducts, the 1000 kW, 10 kV HV-LS-PMSM is taken as an example to establish the finite element model of the prototype, and the correctness of the model is verified by analytical calculation. Firstly, based on the actual length of the stator core, the finite element models of 2D and 3D without ventilation ducts are established. The difference between the two models is compared in calculation of no-load back-EMF, and the difference between them is obtained. Secondly, based on the effective length of the stator core, a 2D finite element model is developed to compare the difference between the actual length of the stator core and its effective length in calculation of the no-load back EMF. Finally, the 3D finite element model with ventilation ducts is proposed, and the influence of ventilation ducts on the no-load back-EMF is analyzed. In this paper, the method for calculation of the no-load back-EMF is presented by 2D finite element model, which*

simplifies the calculation process and improves the efficiency of motor design. References 14, figures 6. tables 2.

**Key words:** line start; permanent magnet; synchronous motor; finite element method; no-load back EMF; actual length and effective length of the stator core; marginal effect.

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