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CONTROL OF 3-ROTOR 7-PHASE BLDC MACHINE

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Context

Multiphase machines are more and more used in specific application thanks to their high fault-tolerant capability and a good quality of torque even with non-sinusoidal electromotive forces.

This work proposes to control a 7-phase hybrid PMSM which contains 3 outer rotors: 2 axial 6-pole rotors and 1 radial 18-pole rotor as shown in Fig. 1. This original structure of machine, adapted for in-wheel machines, intends to extend the speed range for surface PM under constraints of voltage and currents imposed by the supply.

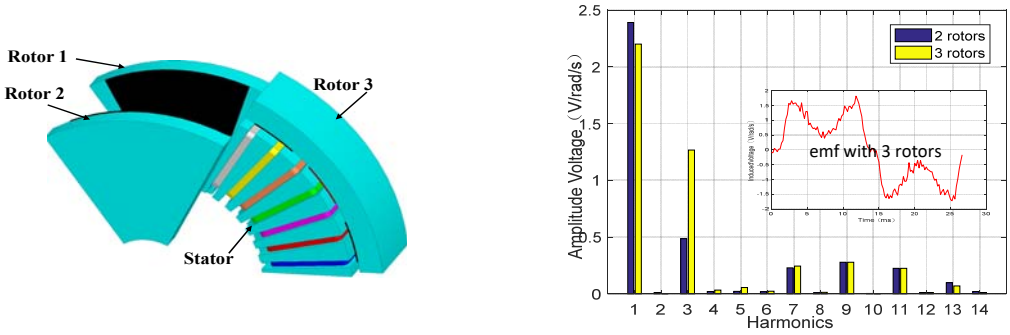

Fig 1. 3-rotor 7-phase BLDC under study

Objective

3-rotor 7-phase BLDC has a quite high number of degrees of freedom (DoF) for control. Moreover, this machine is envisaged to be used in transportation which is an application where there are different operating points needed to be optimized. The most well-known ones are: MTPA and flux weakening operations. Using DoF could lead to different interesting CONTROL STRATEGIES.

Work steps

- Bibliography project about multiphase machines and drives
- State of the art of control strategies proposed for multiphase machines under healthy mode and faulty modes
- Propose different control strategies for 3-rotor 7-phase BLDC
- Simulation with Matlab/Simulink
- Experimental validation based on Dspace board in L2EP at ENSAM site

Key word

Multiphase drives, 3-rotor 7-phase BLDC, PMSM, control strategies, MTPA, flux-weakening, in-wheel machines

References

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