“Fault-tolerant control of a multi-phase machine based on multi machine description”

Lille, 13 - 14 November 2006

This form will be used for the program booklet, the Internet URL of the workshop and the CD.
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Title

“Fault-tolerant control of a multi-phase machine based on multi machine description”
(experimental demonstration session)

Contributors

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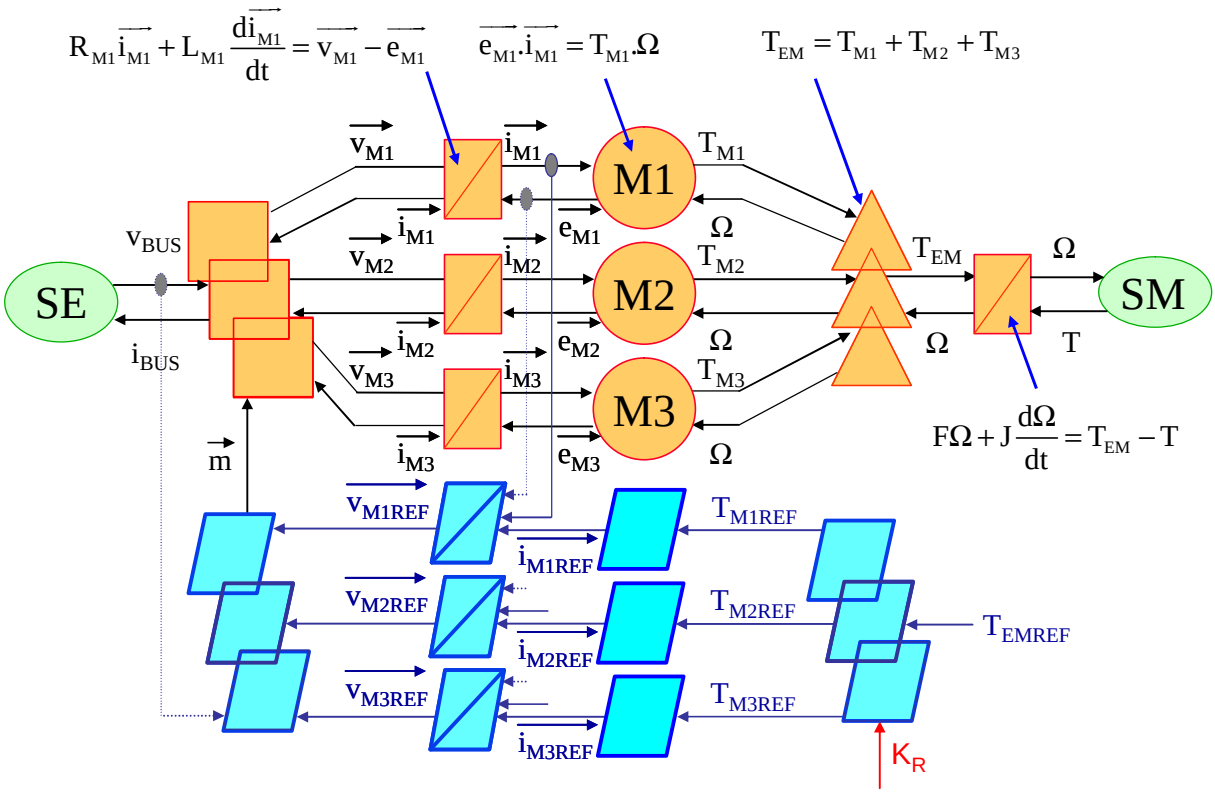
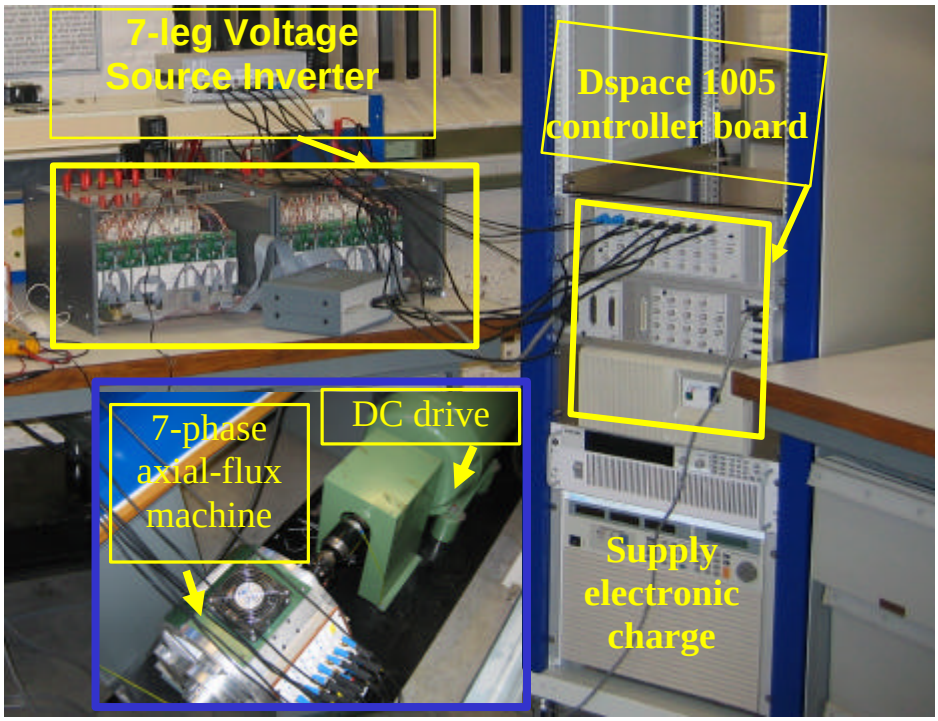
Objective

This presentation deals with control in fault operation of a seven-phase Permanent Magnet Synchronous Axial Flux Machine supplied by a seven-leg Voltage Source Inverter (VSI).

Outline

Using a Multi-Machine description, a seven-phase machine which presents a special ability to be controlled with only five phases supplied has been designed. At first the seven-phase vector-controlled drive is presented. The torque and and the currents are then examined when one or two phases are opened. In order to reduce the observed torque ripples, a specific control deduced from the Multi-Machine modelling is presented and experimental results on torque show the improvements.





Experimental set-up

References

F. Locment, E. Semail, F. Piriou, “Design and Study of a Multi-phase Axial-flux machine”, IEEE Transactions on Magnetics, Vol. n°42, n°4, april 2006, pp. 1427-1430.

F. Locment, E. Semail, X. Kestelyn, A. Bouscayrol, “Control of a seven-phase axial flux machine designed for fault operation “, IECON’06, IEEE International Conference On Industrial Applications of Electronics, Conservatoire National des Arts & Métiers – Paris – France, November 7 – 10, 2006.