SyR-e
User Manual

Simone Ferrari
simone.ferrari@polito.it

September 22, 2021

Contents

Chapter 1

Introduction

This document is a collection of some of the papers and PhD dissertations published along the years, during SyR-e development. In general, it is possible to access to the papers and dissertation through the IRIS portal at https://iris.polito.it/.

Chapter 2

List of Published Papers

[1] G. Pellegrino and F. Cupertino, "FEA-based multi-objective optimization of IPM motor design including rotor losses," *2010 IEEE Energy Conversion Congress and Exposition*, Atlanta, GA, 2010, pp. 3659-3666. Available here

[2] G. Pellegrino and F. Cupertino, "IPM motor rotor design by means of FEA-based multi-objective optimization," *2010 IEEE International Symposium on Industrial Electronics*, Bari, 2010, pp. 1340-1346. Available here

[3] F. Cupertino, G. M. Pellegrino, E. Armando and C. Gerada, "A SyR and IPM machine design methodology assisted by optimization algorithms," *2012 IEEE Energy Conversion Congress and Exposition (ECCE)*, Raleigh, NC, 2012, pp. 3686-3691. Available here

[4] F. Cupertino, G. Pellegrino and C. Gerada, "Design of Synchronous Reluctance Motors With Multiobjective Optimization Algorithms,"in *IEEE Transactions on Industry Applications*, vol. 50, no. 6, pp. 3617-3627, Nov.-Dec. 2014. Available here

[5] M. Palmieri, M. Perta, F. Cupertino and G. Pellegrino, "High-speed scalability of synchronous reluctance machines considering different lamination materials," *IECON 2014 - 40th Annual Conference of the IEEE Industrial Electronics Society*, Dallas, TX, 2014, pp. 614-620. Available here

[6] M. Gamba, G. Pellegrino and F. Cupertino, "Optimal number of rotor parameters for the automatic design of Synchronous Reluctance machines," *2014 International Conference on Electrical Machines (ICEM)*, Berlin, 2014, pp. 1334-1340. Available here

[7] M. Palmieri, M. Perta, F. Cupertino and G. Pellegrino, "Effect of the numbers of slots and barriers on the optimal design of synchronous reluctance machines," *2014 International Conference on Optimization of Electrical and Electronic Equipment (OPTIM)*, Bran, 2014, pp. 260-267. Available here

[8] G. Pellegrino, F. Cupertino and C. Gerada, "Automatic Design of Synchronous Reluctance Motors Focusing on Barrier Shape Optimization,"in *IEEE Transactions on Industry Applications*, vol. 51, no. 2, pp. 1465-1474, March-April 2015. Available here

[9] C. Lu, S. Ferrari and G. Pellegrino, "Two Design Procedures for PM Synchronous Machines for Electric Powertrains," in *IEEE Transactions on Transportation Electrification*, vol. 3, no. 1, pp. 98-107, March 2017. Available here

[10] C. Lu, S. Ferrari, G. Pellegrino, C. Bianchini and M. Davoli, "Parametric design method for SPM machines including rounded PM shape," *2017 IEEE Energy Conversion Congress and Exposition (ECCE)*, Cincinnati, OH, 2017, pp. 4309-4315. Available here

[11] R. Leuzzi, P. Cagnetta, F. Cupertino, S. Ferrari and G. Pellegrino, "Performance assessment of ferrite- and neodymiumassisted synchronous reluctance machines," *2017 IEEE Energy Conversion Congress and Exposition (ECCE)*, Cincinnati, OH, 2017, pp. 3958-3965. Available here

[12] M. Gamba, G. Pellegrino, E. Armando and S. Ferrari, "Synchronous reluctance motor with concentrated windings for IE4 efficiency," *2017 IEEE Energy Conversion Congress and Exposition (ECCE)*, Cincinnati, OH, 2017, pp. 3905-3912. Available here

[13] S. Ferrari, G. Pellegrino, M. Davoli and C. Bianchini, "Reduction of Torque Ripple in Synchronous Reluctance Machines through Flux Barrier Shift," *2018 XIII International Conference on Electrical Machines (ICEM)*, Alexandroupoli, 2018, pp. 2290-2296. Available here

[14] S. Ferrari and G. Pellegrino, "FEA-Augmented Design Equations for Synchronous Reluctance Machines," *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, Portland, OR, 2018, pp. 5395-5402. Available here

[15] S. Ferrari, G. Pellegrino, M. Z. M. Jaffar and I. Husain, "Computationally Efficient Design Procedure for Single-Layer IPM Machines," *2019 IEEE International Electric Machines and Drives Conference (IEMDC)*, San Diego, CA, 2019. Available here

[16] S. Ferrari and G. Pellegrino, "Torque Ripple Minimization of PM-assisted Synchronous Reluctance Machines via Asymmetric Rotor Poles," *2019 IEEE Energy Conversion Congress and Exposition (ECCE)*, Baltimore, MD, 2019. Available here

[17] P. Ragazzo, S. Ferrari, N. Rivière, M. Popescu and G. Pellegrino, "Efficient Multiphysics Design Workflow of Synchronous Reluctance Motors," *2020 XIV International Conference on Electrical Machines (ICEM)*, Goteborg, 2020. Available here

[18] S. Ferrari, P. Ragazzo, G. Dilevrano and G. Pellegrino, "Flux-Map Based FEA Evaluation of Synchronous Machine Efficiency Maps," *2021 IEEE Workshop on Electrical Machine Design, Control and Diagnosis (WEMDCD)*, Modena (Italy). Available here

[19] A. Varatharajan, D. Brunelli, S. Ferrari, P. Pescetto and G. Pellegrino, "syreDrive: Automated Sensorless Control Code Generation for Synchronous Reluctance Motor Drives," *2021 IEEE Workshop on Electrical Machine Design, Control and Diagnosis (WEMDCD)*, Modena (Italy). Available here

[20] S. Ferrari, G. Dilevrano, P. Ragazzo and G. Pellegrino, "The dq-theta Flux Map Model of Synchronous Machines," *2021 IEEE Energy Conversion Congress and Exposition (ECCE)*, Vancouver

[21] S. Ferrari, P. Ragazzo, G. Dilevrano and G. Pellegrino, "Determination of the Symmetric Short-Circuit Currents of Synchronous Permanent Magnet Machines Using Magnetostatic Flux Maps," *2021 IEEE Energy Conversion Congress and Exposition (ECCE)*, Vancouver

Chapter 3

List of Published PhD Thesis

[1] M. Gamba, "Design of non conventional Synchronous Reluctance machines", Politecnico di Torino, 2017. Available here

[2] C. Lu, "Design methods for Surface-Mounted Permanent Magnet Synchronous Machines", Politecnico di Torino, 2018. Available here

[3] S. Ferrari, "Design, Analysis and Testing Procedures for Synchronous Reluctance and Permanent Magnet Machines", Politecnico di Torino, 2020. Available here