

Mats Alaküla
Industriell elektroteknik och automation
LTH profilområde: Energiomställningen
Adresstyp: Besöksadress.
Ole Römers väg 1F
22363
Lund
Sverige
Adresstyp: Postadress.
Box 118
221 00
Lund
Sverige
E-post: mats.alakula@iea.lth.se
Telefon: +46462229284
Mobil: +46705589284



Forskning

Mats Alaküla inledde sin vetenskapliga karriär 1986 som doktorand i styrning och konstruktion av elektriska maskiner och drivsystem. Mats blev professor i industriell elektroteknik 1994 och hans forskning utvecklades mot fordonstillämpningar från hybridfordon till helt elektriska fordon.

Hans kunskaper gav honom en roll som vetenskaplig rådgivare för elektromobilitet på AB Volvo, där han stannade i 14 år, varefter han gick vidare till Elonroad AB i en liknande roll och även som forskningsledare i 12 år i Svensk ElektromobilitetsCentrum.

I dag ligger Mats forskning inom elektromobilitet, inte minst inom energiförsörjning till en komplett elfordonsflotta, både på väg och i terräng inom jordbruk, vägbyggen och gruvsdrift. Mats har många rådgivande roller i olika kommittéer och utredningar och han är en uppskattad föreläsare.

Anställning

Professor

Industriell elektroteknik och automation
Lunds universitet
Lund, Sverige
1994 sep. 21 → present

Profilområdesmedlem

LTH profilområde: Energiomställningen
Lunds universitet
Sverige
2022 sep. 5 → present

Vetenskaplig rådgivare

Elonroad AB
Lund, Sverige
2021 okt. 1 → present

Vetenskaplig rådgivare

Volvo AB
Sverige
2007 sep. 1 → 2021 sep. 30

Temaledare

Swedish Electromobility Centre
Sverige
2007 juli 1 → 2019 juni 30

Forskningsoutput

Reducing the Environmental Impact of Large Battery Systems with Conductive Electric Road Systems—A Technical Overview

Wenander, D. & Alakula, M., 2024 feb., I: *World Electric Vehicle Journal*. 15, 2, 59.

Efficiency evaluation of a conductive Electric Road System with respect to traffic characteristics

Wenander, D., Marquez-Fernandez, F. J. & Alakula, M., 2024, (E-pub ahead of print) I: *IEEE Transactions on Vehicular Technology*. 11 s.

A Forecasting Based Hierarchical Energy Management for Sustainable Data Centers

Li, H., Alakula, M. & Gualous, H., 2023, *IECON Proceedings (Industrial Electronics Conference)*. IEEE Computer Society

An Economic Assessment of the Terminal Electrification for the Logistics Company

Li, H. & Alakula, M., 2023, *PEDG 2023 - 2023 IEEE 14th International Symposium on Power Electronics for Distributed Generation Systems*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 716-721 6 s.

Common Mode Current Measurements in Traction Systems for Electric Vehicles

Widek, P. & Alakula, M., 2023, I: *IEEE Transactions on Industry Applications*. 59, 2, s. 2061-2068 8 s.

Comparison of PMSM versus PMA-SynRM and IM from an Optimized Electric Vehicle Powertrain Perspective

Lu, M., Domingues-Olavarria, G. & Alakula, M., 2023, *2023 26th International Conference on Electrical Machines and Systems, ICEMS 2023*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 4075-4080 6 s. (2023 26th International Conference on Electrical Machines and Systems, ICEMS 2023).

Electric off-road mobile machinery systems with portable energy supply and local energy generation

Wallander, E., Frank, B., Alakula, M. & Márquez-Fernández, F. J., 2023, *2023 IEEE Belgrade PowerTech, PowerTech 2023*. IEEE - Institute of Electrical and Electronics Engineers Inc.

Electro-thermal Models of Power Modules for Stochastic Optimization of Inverters

Byden, H., Bourniche, E., Domingues, G., Alakula, M., Leblay, A. & Marquez, F., 2023, *2023 IEEE Transportation Electrification Conference and Expo, ITEC 2023*. IEEE - Institute of Electrical and Electronics Engineers Inc.

Modelling Electric Transients in a Conductive Electric Road System

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Optimization of Induction Machine Design for Electric Vehicle Powertrain

Lu, M., Domingues-Olavarria, G., Marquez-Fernandez, F. J., Byden, H. & Alakula, M., 2023, *2023 IEEE International Electric Machines and Drives Conference, IEMDC 2023*. IEEE - Institute of Electrical and Electronics Engineers Inc., (2023 IEEE International Electric Machines and Drives Conference, IEMDC 2023).

Optimization of Powertrain Platform for Electric Passenger Vehicles

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Parameter Identification For Inter Turn Fault Detection In Permanent-Magnet Synchronous Motors Using Stator Flux Linkage DC Offset Monitoring

Upadhyay, A., Reinap, A. & Alakula, M., 2023, *Proceedings of the 2023 IEEE 14th International Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives, SDEMPED 2023*. Zarri, L. & Lee, S. B. (red.). IEEE - Institute of Electrical and Electronics Engineers Inc., s. 498-504 7 s.

Statistical Assessment of Core Loss Measurement Techniques for Laminated Steel

Colombo, L., Soltanipour, S., Tokat, A., Reinap, A., Thiringer, T., Marquez Fernandez, F. J., Lindström, J. & Alakula, M., 2023, *Statistical Assessment of Core Loss Measurement Techniques for Laminated Steel*. IEEE - Institute of Electrical and Electronics Engineers Inc., (IEEE Workshop on Electrical Machines Design, Control and Diagnosis (WEMDCD); vol. 2023).

Dovetail Design for Direct Cooled Rotor: Design and Manufacturing

Estenlund, S., Tokat, A., Engqvist, J. & Alaküla, M., 2022 okt. 13, *2022 International Conference on Electrical Machines (ICEM)*. s. 2121-2127 7 s.

Performance Degradation due to Cut Edge Effect for an Axial-Flux Induction Machine

Colombo, L., Tokat, A., Bitsi, K., Marquez Fernandez, F. J. & Alaküla, M., 2022 okt. 13, *Proceedings - 2022 International Conference on Electrical Machines (ICEM)*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 1253-1259 7 s.

Conductive Electric Road Localization and Related Vehicle Power Control

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Assessment of future EV charging infrastructure scenarios for long-distance transport in Sweden

Marquez-Fernandez, F. J., Bischoff, J., Domingues-Olavarria, G. & Alakula, M., 2022, I: *IEEE Transactions on Transportation Electrification*. 8, 1, s. 615-626

A Theoretical Study Of Stator Flux Linkage DC Offset Based Stator Fault Detection For PMSM Drive Systems

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Modelling of power flow and losses in a conductive Electric Road System

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Energy supply to buses on a conductive electric road: An evaluation of charger topologies and electric road characteristics

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Electric drivetrain optimization for a commercial fleet with different degrees of electrical machine commonality

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Concept design of electric cruise and startability axles for long haul heavy vehicles to maximise driving range

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Measuring electric properties of a conductive electric road

Wenander, D., Abrahamsson, P., Marquez-Fernandez, F. J. & Alakula, M., 2021, *2021 AEIT International Conference on Electrical and Electronic Technologies for Automotive, AEIT AUTOMOTIVE 2021*. IEEE - Institute of Electrical and Electronics Engineers Inc.

Automatic static charging of electric distribution vehicles using ERS technology

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Integrated and isolated EV charger for AC and electric road applications

Karlsson, A. & Alakula, M., 2020, *2020 International Symposium on Power Electronics, Electrical Drives, Automation and Motion, SPEEDAM 2020*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 114-119 6 s. 9161877. (2020 International Symposium on Power Electronics, Electrical Drives, Automation and Motion, SPEEDAM 2020).

Modeling of electric power system in electric vehicles

Widek, P. & Alakula, M., 2020, *2020 International Symposium on Power Electronics, Electrical Drives, Automation and Motion, SPEEDAM 2020*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 293-298 6 s. 9161884. (2020 International Symposium on Power Electronics, Electrical Drives, Automation and Motion, SPEEDAM 2020).

Characterization of Onboard Condition Monitoring Techniques for Stator Insulation Systems in Electric Vehicles: A Review
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Thermal Assessment of an ERS for Static Charging of Electric Vehicles

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Using Multi-Agent Transport Simulations to Assess the Impact of EV Charging Infrastructure Deployment

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Alternative EV powertrain topologies designed for operation in a conductive electric road system

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Thermal modeling of an ERS during static charging

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Electric safety challenges with a conductive electric road system-Chassis potential modeling and measurement

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Thermal modeling of an ERS during dynamic charging

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Lumped-parameter grey-box modelling of traction machines for low-speed operation

Hall, S. & Alakula, M., 2018 okt. 25, *Proceedings - 2018 23rd International Conference on Electrical Machines, ICEM 2018*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 2668-2674 7 s. 8506982

Power Losses and Heat Extraction in a Stator with Directly Air-Cooled Laminated Windings

Reinap, A., Hogmark, C., Marquez-Fernandez, F. J., Alakiilla, M. & Andersson, M., 2018 okt. 25, *Proceedings - 2018 23rd International Conference on Electrical Machines, ICEM 2018*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 2675-2681 7 s. 8506732

Electric roads: Analyzing the societal cost of electrifying all Danish road transport

Domingues-Olavarria, G., Márquez-Fernández, F. J., Fyhr, P., Reinap, A. & Alakula, M., 2018 juni 7, I: *World Electric Vehicle Journal*. 9, 1, 9.

Assessment of cooling integration with direct cooled windings

Reinap, A., Gabassi, M., Alakula, M. & Andersson, M., 2018, *2018 IEEE International Conference on Electrical Systems for Aircraft, Railway, Ship Propulsion and Road Vehicles and International Transportation Electrification Conference, ESARS-ITEC 2018*. IEEE - Institute of Electrical and Electronics Engineers Inc., 8607655

Dynamic Testing Characterization of a Synchronous Reluctance Machine

Wiedemann, S., Hall, S., Kennel, R. & Alakula, M., 2018, I: *IEEE Transactions on Industry Applications*. 54, 2, s. 1370-1378

EV powertrain topologies for electric road applications

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Dynamic Magnetic Model Identification of Permanent Magnet Synchronous Machines

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From Chip to Converter: A Complete Cost Model for Power Electronics Converters

Domingues, G., Fyhr, P., Reinap, A., Andersson, M. & Alakula, M., 2017 nov. 1, I: *IEEE Transactions on Power Electronics*. 32, 11, s. 8681-8692 12 s., 7814334.

Dynamic charging solutions in Sweden: An overview

Alakula, M. & Marquez-Fernandez, F. J., 2017 okt. 23, *2017 IEEE Transportation Electrification Conference and Expo, Asia-Pacific, ITEC Asia-Pacific 2017*. IEEE - Institute of Electrical and Electronics Engineers Inc., 8080781

Electric roads: The importance of sharing the infrastructure among different vehicle types

Marquez-Fernandez, F. J., Domingues-Olavarria, G., Lindgren, L. & Alakula, M., 2017 okt. 23, *2017 IEEE Transportation Electrification Conference and Expo, Asia-Pacific, ITEC Asia-Pacific 2017*. IEEE - Institute of Electrical and Electronics Engineers Inc., 8080780

Performance and manufacturability tradeoffs of different electrical machine designs

Fyhr, P., Domingues, G., Reinap, A., Andersson, M. & Alakula, M., 2017 aug. 3, *2017 IEEE International Electric Machines and Drives Conference, IEMDC 2017*. IEEE - Institute of Electrical and Electronics Engineers Inc., 8002181

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Scalable performance, efficiency and thermal models for electric drive components used in powertrain simulation and optimization

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Societal cost of electrifying all danish road transport

Domingues-Olavarria, G., Márquez-Fernández, F. J., Fyhr, P., Reinap, A. & Alakula, M., 2017 jan. 1, *EVS 2017 - 30th International Electric Vehicle Symposium and Exhibition 2017*. Landesmesse Stuttgart GmbH

Thermal design of an electric road system

Abrahamsson, P. & Alakula, M., 2017 jan. 1, *EVS 2017 - 30th International Electric Vehicle Symposium and Exhibition*. Landesmesse Stuttgart GmbH, Vol. 2017.

Direct electromagnetic actuation on high ratio gears

Reinap, A., Alakula, M. & Domingues, G., 2016 nov. 2, *Proceedings - 2016 22nd International Conference on Electrical Machines, ICEM 2016*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 743-749 7 s. 7732609

A method for in-situ characterization of PMSM traction machines

Hall, S., Andersson, R. & Alakula, M., 2016 aug. 29, *EEEIC 2016 - International Conference on Environment and Electrical Engineering*. IEEE - Institute of Electrical and Electronics Engineers Inc., 7555698

Dynamic Testing characterization of a synchronous reluctance machine

Wiedemann, S., Kennel, R. M., Hall, S. & Alakula, M., 2016 maj 20, *2016 11th International Conference on Ecological Vehicles and Renewable Energies, EVER 2016*. IEEE - Institute of Electrical and Electronics Engineers Inc., 7476426

Degradation and Fatigue of Epoxy Impregnated Traction Motors Due to Thermal and Thermal Induced Mechanical Stress: Part I: Thermal Mechanical Simulation of Single Wire due to Evenly Distributed Temperature

HUANG, ZHE., Reinap, A. & Alakula, M., 2016, *8th IET International Conference on Power Electronics, Machines and Drives (PEMD 2016)*. Institution of Engineering and Technology

Degradation and fatigue of epoxy impregnated traction motors due to thermal and thermal induced mechanical stress - Part I: Thermal mechanical simulation of single wire due to evenly distributed temperature

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Degradation and fatigue of epoxy impregnated traction motors due to thermal and thermal induced mechanical stress - Part II: Thermal mechanical simulation of multiple wires due to evenly and unevenly distributed temperature

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Dielectric Properties Modeling and Measurement of Single Tooth Coil Insulation System under Accelerated Degradation Test

HUANG, ZHE., Reinap, A. & Alakula, M., 2016, *IEEE International Conference on Electrical Machines (ICEM) 2016*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 2698-2703 6 s. 7732903

Engineering considerations on skewing of an interior permanent magnet synchronous machine for parallel hybrid electric heavy vehicles

Andersson, R., Reinap, A. & Alakula, M., 2016, *IET Conference Publications*. CP684 uppl. Institution of Engineering and Technology, Vol. 2016.

Electrical Machine Design with Directly Cooled Laminated Fractional Pitch Windings

Reinap, A., Högmark, C., Frogner, K., Lundström, F., Andersson, M., Alakula, M. & Wang, L., 2015, *[Host publication title missing]*.

Predictive monitoring of turn-on-turn insulation in single tooth coils

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Heat transfer analysis of a traction machine with directly cooled laminated windings

Reinap, A., Márquez-Fernández, F. J., Andersson, R., Högmark, C., Alakula, M. & Göransson, A., 2014 dec. 12, *2014 4th International Electric Drives Production Conference, EDPC 2014 - Proceedings*. IEEE - Institute of Electrical and Electronics Engineers Inc., 6984395

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Consistency analysis of torque measurements performed on a PMSM using dynamic testing

Hall, S., Loayza Vargas, Y., Reinap, A. & Alaküla, M., 2014, *2014 International Conference on Electrical Machines (ICEM)*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 1529-1535

Dynamic Testing Characterization of a HEV Traction Motor

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FPGA implementation of a Deadbeat Direct Torque and Flux Control Scheme for Induction Machines

Domingues, G., Marquez, F. & Alaküla, M., 2014, *2014 International Conference on Electrical Machines (ICEM)*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 776-782

Inductive Analysis of a Multiconductor System Prototype

Abdallah, F. & Alaküla, M., 2014, *2014 International Symposium on Electromagnetic Compatibility (EMC Europe)*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 1170-1175

Inductive coupling matrix of a multiconductor system for a winding-on-core prototype

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Performance Estimation of Hybrid Excited Machine with Alternating Pole Configuration

Reinap, A., Alaküla, M., Hall, S. & Estenlund, S., 2014, *2014 International Conference on Electrical Machines (ICEM)*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 2638-2643

An Integrated 20-kW Motor Drive and Isolated Battery Charger for Plug-In Vehicles

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Capacitively coupled transmission line model and validation of a winding-on-core prototype

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Grid-Connected Integrated Battery Chargers in Vehicle Applications: Review and New Solution

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Characterization and application of forced cooling channels for traction motors in HEVs

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Direct oil cooling of traction motors in hybrid drives

Huang, Z., Nategh, S., Alaküla, M., Lassila, V. & Yuan, J., 2012, *2012 IEEE International Electric Vehicle Conference (IEVC 2012)*. s. 43 8 s.

Electrical machines with laminated winding for hybrid vehicle application

Högmark, C., Andersson, R., Reinap, A. & Alaküla, M., 2012, *2nd International Electric Drives Production Conference (EDPC)*. IEEE - Institute of Electrical and Electronics Engineers Inc., s. 36-41

Impact of soft magnetic material on construction of radial flux electrical machines

Reinap, A. & Alaküla, M., 2012, I: *IEEE Transactions on Magnetics*. 48, 4, s. 1613-1616

Laminated winding with rapid cooling capability for electrical machines

Högmark, C., Reinap, A., Frogner, K. & Alaküla, M., 2012.

Modular three-phase machines with laminated winding for hybrid vehicle application

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New manufacturing methods for electric motors using different soft magnetic material combinations

Siesing, L., Reinap, A., Andersson, M. & Alaküla, M., 2012, [*Host publication title missing*]. Hahn, I. (red.). IEEE - Institute of Electrical and Electronics Engineers Inc., s. 366-372

On increasing fuel efficiency by operator assistant systems in a wheel loader

Frank, B., Skogh, L., Filla, R. & Alaküla, M., 2012, [*Host publication title missing*]. China Machine Press, s. 155-161

On wheel loader fuel efficiency difference due to operator behaviour distribution

Frank, B., Skogh, L. & Alaküla, M., 2012, *Commercial Vehicle Technology 2012*. Shaker Verlag, s. 329-346 17 s.

Redesign of an Electrical Rear Wheel Drive (E-RWD) for a hybrid vehicle in a given drive cycle

Marquez, F., Huang, Z. & Alaküla, M., 2012, *2012 XXth International Conference on Electrical Machines (ICEM 2012)*. s. 2702-2708

Sub-Optimization of a claw-pole structure according to material properties of soft magnetic materials

Reinap, A., Hagstedt, D., Högmark, C. & Alaküla, M., 2012, I: *IEEE Transactions on Magnetics*. 48, 4, s. 1681-1684

An Isolated High-Power Integrated Charger in Electrified-Vehicle Applications

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Dynamic Evaluation of the Overloading Potential of a Convection Cooled Permanent Magnet Synchronous Motor

Marquez, F., Reinap, A., Huang, Z. & Alaküla, M., 2011, *2011 IEEE International Electric Machines&Drives Conference (IEMDC)*. s. 13-18 6 s.

Electro-thermal Simulations of a Power Electronic Inverter for a Hybrid Car

Ottosson, J., Alaküla, M. & Hagstedt, D., 2011, *Electric Machines & Drives Conference (IEMDC), 2011 IEEE International*. s. 1619-1624

Evaluation of a Semi Claw-Pole Machine with SM2C Core

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Loayza Vargas, Y., Reinap, A. & Alaküla, M., 2011, *IEEE International Symposium on Diagnostics for Electric Machines, Power Electronics & Drives (SDMPED), 2011 : 5 - 8 Sept. 2011, Bologna, Italy*. s. 550-555 6 s.

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Design, optimization and construction of an electric motor for an Electric Rear Wheel Drive Unit application for a Hybrid Passenger Car

Marquez, F., Reinap, A. & Alaküla, M., 2010, *ICEM 2010. 19th International Conference on Electrical Machines, 2010*.

Prototype based study of different winding configurations with SM2C core

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