



[MO1] Electromagnetic Linear Motors and Actuators

Session Date May 19 (Mon.), 2025

Session Time 11:10–12:30

Session Room Room A (101)

[MO1_01]

11:10–11:30

End Force Analysis and Optimization of Permanent Magnet Linear Synchronous Motor Based on Chamfered Auxiliary Teeth

Lize Wu, Yanxin Li, and Qinfen Lu

Zhejiang University, China

[MO1_02]

11:30–11:50

Prediction of Electromechanical Dynamic Characteristics of Voice Coil Actuator for Circuit Breaker

Ki-O Kim¹, Jinho Choi¹, Seong-Hyeon Kim¹, Du-Ha Park¹, Jun-Yeol Ryu², and Myung-Seop Lim¹¹*Hanyang University, Korea*, ²*Korea Automotive Technology Institute, Korea*

[MO1_03]

11:50–12:10

Study of the Basis for Improving the Charging Characteristics Using LC Resonance in the Vertical Linear Vibration Generator

Hodaka Kojima, Eiji Shirahama, Shinjiro Araki, Ken-ichi Kondo, and Shunsuke Ohashi

Kansai University, Japan

[MO1_04]

12:10–12:30

Ultra-High Speed Linear Induction Motor Design for Low Vacuum Tube Transportation

Xiao Hua Wang, Zhi Ming Liao, and Yu Jin

Tongji University, China



[MO2] Power Electronics and Control Methods for Linear Drives

Session Date May 19 (Mon.), 2025

Session Time 11:10–12:30

Session Room Room B (102)

[MO2_01]

11:10–11:30

Sensorless Position Estimation Method of Winding–Segmented Linear Permanent Magnet Synchronous Motor Based on Model Reference Adaptive

Weiwang He, Yanxin Li, Qinfen Lu, and Jinghan Yu

Zhejiang University, China

[MO2_02]

11:30–11:50

Measures Against Overshooting During Levitation and Propulsion Control of Linear Induction Motors

Takumu Horimoto, Soma Jinno, Hidehito Matayoshi, and Toshimitsu Morizane

Osaka Institute of Technology, Japan

[MO2_03]

11:50–12:10

Full Electrical Parameter Identification Method for PMLSM Based on Triangular Wave Injection And Considering Current Differential Terms

Huanchen Guo, Zhixun Ma, and Haichuan Niu

Tongji University, China

[MO2_04]

12:10–12:30

Improvement in Efficiency through Compression Ratio Adjustment in Free–Piston Engine Linear Generator

Kyosuke Hayakawa¹, Tsutomu Mizuno¹, Mitsuhide Sato¹, Yuhei Sakane², Kaname Naganuma², and Ken Enya³

¹*Shinshu University, Japan*, ²*Kanazawa Institute of Technology, Japan*, ³*Enya Manufacturing Co., Ltd., Japan*



[MO3] Electromagnetic Linear Motors and Actuators

Session Date May 19 (Mon.), 2025

Session Time 14:00–15:20

Session Room Room A (101)

[MO3_01]

14:00–14:20

Development of a Scale Vehicle to Test and Analyze the Performance of a Homopolar Linear Motor and its Electromagnetic Levitation System

David Melly¹, Valentin Pasche², Vincent Bourquin², and Samuel Chevailler¹

¹University of Applied Sciences and Arts Western Switzerland Valais, Switzerland, ²School of Engineering and Architecture of Fribourg, Switzerland

[MO3_02]

14:20–14:40

Reliability-Based Robust Design Optimization of Magnetic Locking System for Automobile Trunks Using PSO Algorithm

Hyun-Woo Wui¹, Jae-Hoon Cho¹, Ho-Jin Oh¹, Kyoung taek Kwak², Moo seok Kwak², Kyeong Jun Lim², Jae Seung Lee², Jin Ho Hwang², Dong Hwan Lim², Seok-Won Jung¹, and Sang-Yong Jung¹

¹Sungkyunkwan University, Korea, ²Hyundai Motor Company, Korea

[MO3_03]

14:40–15:00

Research on Tubular Linear Permanent Magnet Vernier Motor for Automobile Active Electromagnetic Suspension

Yuhang Liu, He Zhang, Junren Mu, and Ye Zhao

Harbin Institute of Technology, China

[MO3_04]

15:00–15:20

Research on Double Side Linear Synchronous Motor Scheme for High-Speed Propulsion

Wenbai Zhang and Guobin Lin

Tongji University, China



[MO4] Power Electronics and Control Methods for Linear Drives

Session Date May 19 (Mon.), 2025

Session Time 14:00–15:40

Session Room Room B (102)

[MO4_01]

14:00–14:20

Modeling the Transient Switching Process of Stator Segments in Series–Fed Long Primary Dual Three–Phase Linear Induction Motor

Yuchen Liang^{1,2}, Liming Shi^{1,2}, Zixin Li^{1,2}, Manyi Fan¹, Jinhai Liu^{1,2}, and Ganlin Kong^{1,2}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

[MO4_02]

14:20–14:40

Thrust Ripple Compensation and Disturbance Rejection Control Method for Permanent Magnet Linear Synchronous Machines

Ziyu Zou, Qinfen Lu, and Yanxin Li

Zhejiang University, China

[MO4_03]

14:40–15:00

A Study on Performance Improvement of Saliency–Based Position Sensorless Drive for Permanent Magnet Linear Synchronous Motor

Tadashi Hirayama¹ and Kuniaki Muto²

¹Kogakuin University, Japan, ²Kagoshima University, Japan

[MO4_04]

15:00–15:20

Model–Free Predictive Direct Speed Control for Maglev Transportation Long Stator Linear Motor

Haichuan Niu, Zhixun Ma, Jian Huang, and Guobin Lin

Tongji University, China

[MO4_05]

15:20–15:40

Primary Total Flux Orientation Control Method for Segmented Parallel–Connected Long Primary Double–Sided Linear Induction Machine Driven by a Single Inverter

Maixin Zhang¹, Wei Xu², Kaiju Liao², Yirong Tang¹, Liming Shi², Yaohua Li², and Dayi Li¹

¹Huazhong University of Science and Technology, China, ²Chinese Academy of Sciences, China



[MO5] Electromagnetic Linear Motors and Actuators

Session Date May 19 (Mon.), 2025

Session Time 16:00–17:20

Session Room Room A (101)

[MO5_01]

16:00–16:20

Analysis of Demagnetization Limits for a Limited Angle Rotary Voice Coil Motor

Metin Aydin and Emre Cevik

Kocaeli University, Turkiye

[MO5_02]

16:20–16:40

Trust Ripple Reduction of PMLSM Considering Magnetic Saturation Under Load Condition by Frozen Permeability Method

In-Seok Song, Taek-Hyo Nam, Young-Ho Hwang, Hyung-Woo Kim, Seok-Won Jung, and Sang-Yong Jung

Sungkyunkwan University, Korea

[MO5_03]

16:40–17:00

An Improved Sensorless Control Method for Distributed Chain Winding LSLSM Applied in High-Speed Maglev Trains

Zicong Zhang, Guobin Lin, Zhiming Liao, and Wenbai Zhang

Tongji University, China

[MO5_04]

17:00–17:20

Analysis of Eddy Current Loss in Permanent Magnet Linear Synchronous Generator Considering Bolt-Mounted Halbach Array Magnet

Yeon Tae Choi¹, Gang-Hyeon Jang³, Kyung-Hun Shin², and Jang-Young Choi¹¹Chungnam National University, Korea, ²Changwon National University, Korea, ³Korea Electric Power Research Institute, Korea



[MO6] Levitation Technologies

Session Date May 19 (Mon.), 2025

Session Time 16:00–17:20

Session Room Room B (102)

[MO6_01]

16:00–16:20

Comparative Analysis of Wire-Wound and PCB Coil Magnetically Levitation Moving-Magnet Planar Motor

Wei-Feng Hu¹, Hong-Jin Hu¹, Guang-Zhong Cao¹, and De-Liang Liang²

¹Shenzhen University, China, ²Xi'an Jiaotong University, China

[MO6_02]

16:20–16:40

Proposal for a Stress Applying Mechanism for Mechanical Testing Machines Using Magnetic Levitation

Shiori Doi, Koichi Oka, and Takenori Suzuki

Kochi University of Technology, Japan

[MO6_03]

16:40–17:00

Design of Staggered Electromagnets for Compact 6-DoF Levitated Stage with Transverse Flux Permanent Magnet Linear Synchronous Motor

Yueying Yang¹, Wataru Ohnishi¹, Takafumi Koseki¹, and Hounng-Joong Kim²

¹The University of Tokyo, Japan, ²KOVERY Motor Inc., Korea

[MO6_04]

17:00–17:20

Static Measurement of a Contactless Electromagnetic Isolator Adaptive to Variable Payload Mass

Wentao Li, Jianqiang Yao, Liang Guo, and Chenyang Ding

Fudan University, China



[TO1] Electromagnetic Linear Motors and Actuators

Session Date May 20 (Tue.), 2025

Session Time 10:00–11:40

Session Room Room A (101)

[TO1_01] 10:00–10:20

Uniform Heat Dissipation Structure for High Power Density PMSPM with Moving Magnet

Ronglu Wang, Lu Zhang, Chunqiu Zhao, and Chenyang Shi

Harbin Institute of Technology, China

[TO1_02] 10:20–10:40

Design Optimization and Analysis of Consequent-Pole MLS for WEC

Fengyu Shen¹, Lei Huang¹, Yuan Li¹, Minshuo Chen², Haoran Wang¹, and Minqiang Hu¹¹*Southeast University, China*, ²*Nanjing Institute of Technology, China*

[TO1_03] 10:40–11:00

Analysis of 2-D FEA Methods for Linear Oscillating Actuators Considering the Segmented Structure

Seong-Hyeon Kim¹, Du-Ha Park¹, Jin-Ho Choi¹, Soo-Hwan Park², and Myung-Seop Lim¹¹*Hanyang University, Korea*, ²*Dongguk University, Korea*

[TO1_04] 11:00–11:20

Optimal Design to Prevent Permanent Magnet Irreversible Demagnetization and Reducing Cogging Force in Permanent Magnet Linear Motors

Seah Park, Hyung-Woo Kim, In-Seok Song, and Sang-Yong Jung

Sungkyunkwan University, Korea

[TO1_05] 11:20–11:40

Design Optimization and Analysis of Linear Force Motor Considering Spring Constant

Yu Jun Jeong and Dong Kuk Lim

University of Ulsan, Korea



[TO2] Applications of Linear Drives and Levitation Technologies

Session Date May 20 (Tue.), 2025

Session Time 10:00–11:40

Session Room Room B (102)

[TO2_01]

10:00–10:20

Impact of Forces of Linear Air-Cored Synchronous Motors on Electromagnetic Suspension Systems Using the Example of the TUM Hyperloop Demonstrator

Tim Hofmann, Oliver Tim Kleikemper, and Agnes Jocher

Technical University of Munich, Germany

[TO2_02]

10:20–10:40

Improvement of the Go-Back Force Based on Excitation Position in a Permanent Magnet-HTS Hybrid Maglev Transportation System

Haruka Shirotani, Yoshikage Abe, Alex Hitoshi Takinami, Ken-ichi Kondo, and Shunsuke Ohashi

Kansai University, Japan

[TO2_03]

10:40–11:00

Modeling and Electromagnetic-Dynamic Analysis of Null-Flux EDS Considering Line-Motor Propulsion System

Mingming Li, Zhiping Li, Weifeng Pan, Sanchun Nie, and Jun Zheng

Southwest Jiaotong University, China

[TO2_04]

11:00–11:20

Highly Responsive Drive of a Multi-Degree-of-Freedom Magnetic Levitation Planar Motor by Model-Based Feedforward Control

Keigo Nakata¹, Wataru Ohnishi¹, Takafumi Koseki¹, Yuichiro Nakamura², Kenji Takahashi², and Hiroyuki Sekiguchi²

¹*The University of Tokyo, Japan*, ²*Mitsubishi Electric Corporation, Japan*

[TO2_05]

11:20–11:40

Fundamental Study on Visual Servo in Maglev Linear Synchronous Drive –Comparison of Position-Based and Image-Based Methodologies–

Jianlong Gao, Yueying Yang, Wataru Ohnishi, and Takafumi Koseki

The University of Tokyo, Japan



[TO3] Electromagnetic Linear Motors and Actuators

Session Date May 20 (Tue.), 2025

Session Time 13:10–14:30

Session Room Room A (101)

[TO3_01]

13:10–13:30

Design of a 6-DoF Rotating Magnetically Levitated Sample Manipulator

Coen Custers, Ronald Faassen, Maryn Wijnhoven, Lucas Koorneef, Dick Laro, Martijn Princen, and Theo Ruijl

MI-Partners, The Netherlands

[TO3_02]

13:30–13:50

Design Optimization of Single-Phase Linear Oscillating Actuator Considering Effect of Detent Force on Mechanical Resonance in Linear Compressor

Soo-Hwan Park¹, Ji-Hyeon Lee², Du-Ha Park², Jaehoon Jeong³, and Myung-Seop Lim²¹*Dongguk University, Korea*, ²*Hanyang University, Korea*, ³*LG Electronics Co., Ltd., Korea*

[TO3_03]

13:50–14:10

Analysis of Injected Current in End Compensation Coils on Detent Force and Thrust Ripple Reduction in Permanent Magnet Linear Synchronous Motors

Junren Mu, He Zhang, Ye Zhao, Yuhang Liu, and Baoquan Kou

Harbin Institute of Technology, China

[TO3_04]

14:10–14:30

Electromagnetic Design of Superconducting Linear Actuators and Magnetic Bearings for Liquid Hydrogen Pumps

Satsuki Okumura, Hikaru Kitamura, and Hiroyuki Ohsaki

University of Tokyo, Japan



[TO4] Electromagnetic Linear Motors and Actuators
& Applications of Linear Drives and Levitation Technologies & Methods for Prediction and Analysis

Session Date May 20 (Tue.), 2025

Session Time 13:10–14:30

Session Room Room B (102)

[TO4_01]

13:10–13:30

Core Loss Analysis of Linear Oscillatory Actuator Using Analytical Method Considering 3D Effects

Kyung-Hun Shin¹, Jeong-Man Kim², and Jang-Young Choi³

¹Chagnwon National University, Korea, ²Hyundai Mobis Co., Ltd., Korea, ³Chungnam National University, Korea

[TO4_02]

13:30–13:50

Adaptability Optimization of the Homopolar Linear Synchronous Motor Applied to HTS Maglev

Sanchun Nie, Mingming Li, Yi Su, Jun Zheng, and Zigang Deng

Southwest Jiaotong University, China

[TO4_03]

13:50–14:10

Optimal Design of Thomson-Coil Actuator for Arc Eliminator in High-Voltage Applications

Gang Hoon Kim and Dong Kuk Lim

University of Ulsan, Korea

[TO4_04]

14:10–14:30

Structural Optimization and Research of a Novel Linear-Rotary Permanent Magnet Motor

Yunnan Feng, Yanxin Li, and Qinfen Lu

Zhejiang University, China



[TO5] Electromagnetic Linear Motors and Actuators

| | |
|--------------|---------------------|
| Session Date | May 20 (Tue.), 2025 |
| Session Time | 16:00–17:20 |
| Session Room | Room A (101) |

[TO5_01]

16:00–16:20

Investigation on the Characteristics of a Linear Motor with Magnetic Spring for the Cryocoolers
Zhouhang Hu^{1,2,3}, Huiming Zou^{1,3}, Xuan Yu^{1,2,3}, Rui Kong^{1,2,3}, Shuo Zhang^{1,2,3}, Fanchen Kong^{1,2,3},
and Mingsheng Tang^{1,3}

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China,
³Key Laboratory of Cryogenic Science and Technology, China

[TO5_02]

16:20–16:40

Research on Ignition Mechanism of Plasma Brush Applied to Series Linear Helical Launcher
Housheng Wang^{1,2}, Naijin Wen^{1,2}, Jianchao Wang^{1,2}, Bendong Ma^{1,2}, Jie Bai¹, and Pengyun Jin¹

¹Chinese Academy of Sciences, China, ²University of Chinese Academy of Sciences, China

[TO5_03]

16:40–17:00

Analysis of Secondary Eddy Current Losses in Double-Sided Permanent Magnet Synchronous
Linear Motor with Step-Skew

Ho-Jin Oh¹, Jin Hwan Lee², and Sang-Yong Jung¹

¹Sungkyunkwan University, Korea, ²Chonnam National University, Korea

[TO5_04]

17:00–17:20

Design and Evaluation of a Tubular Permanent Magnet Linear Generator for Compact Wave
Energy Systems

Kyeong-Tae Yu¹, Jeong-Man Kim¹, Kyung-Hun Shin², and Jang-Young Choi¹

¹Chungnam National University, Korea, ²Changwon National University, Korea



[TO6] Methods for Prediction and Analysis

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|--------------|---------------------|
| Session Date | May 20 (Tue.), 2025 |
| Session Time | 16:00–17:20 |
| Session Room | Room B (102) |

[TO6_01]

16:00–16:20

Manufacturing Tolerances and Position Accuracy of Moving–Magnet Planar Motors

B. J. A. Kuijpers, J. W. Jansen, and E. A. Lomonova

Eindhoven University of Technology, The Netherlands

[TO6_02]

16:20–16:40

A Study of Reducing Analysis Time on Minimizing Detent Torque in Linear Motors Using Surrogate Model

Ji–Hoon Han, Jong–Hoon Park, Seung–Min Song, and Sun–Ki Hong

Hoseo University, Korea

[TO6_03]

16:40–17:00

Magnetic Field Analysis and Performance Evaluation of Tubular Permanent Magnet Linear Coupling Based on Analytical Approach

Yeon–Su Kim¹, Jeong–Man Kim¹, Kyung–Hun Shin², and Jang–Young Choi¹

¹*Chungnam National University, Korea*, ²*Changwon National University, Korea*

[TO6_04]

17:00–17:20

Analytical Calculation of Detent Force in a Linear Motor Considering Stator–Induced Air–Gap Tolerance

Dong Hoon Ko, Hye Seong Kim, Yong Min Lee, and Min ro Park

Soonchunhyang University, Korea



[WO1] Electromagnetic Linear Motors and Actuators

| | |
|--------------|---------------------|
| Session Date | May 21 (Wed.), 2025 |
| Session Time | 10:00–11:20 |
| Session Room | Room A (101) |

[WO1_01]

10:00–10:20

Multiphysical Analysis of a Rail Gun for Power System Application

Fabio Freschi¹, Maurizio Repetto¹, Fermin Gomez De Leon², and Ara Bissal²¹Politecnico di Torino, Italy, ²Huawei Technologies Duesseldorf GmbH, Germany

[WO1_02]

10:20–10:40

Comparison of Braking Characteristics of Electropermanent Magnetic Retarders by Finite Element Analysis

Hiromu Takahashi and Masayuki Kato

Ibaraki University, Japan

[WO1_03]

10:40–11:00

Analysis and Comparison of a Linear Dual Stator Induction Motor for Various Solid Rotor Structures

Metin Aydin and Egemen Durna

Kocaeli University, Turkiye

[WO1_04]

11:00–11:20

Comparative Study of Tubular Flux-Switching Permanent Magnet Machines with Different Hybrid Magnetic Cores

Seung-Ahn Chae¹, Gwan-Soo Park¹, and Dae-Yong Um²¹Pusan National University, Korea, ²Gyeongsang National University, Korea



[WO2] Electromagnetic Linear Motors and Actuators

Session Date May 21 (Wed.), 2025

Session Time 10:00–11:20

Session Room Room B (102)

[WO2_01]

10:00–10:20

Comparison of Electromagnetic Performances for Permanent Magnet Linear Synchronous Machine with Different Magnetization Patterns Based on Subdomain Method

Kyung-Hun Shin¹, Cheol Han², and Jang-Young Choi³

¹Chagnwon National University, Korea, ²Hanon Systems, Korea, ³Chungnam National University, Korea

[WO2_02]

10:20–10:40

Cogging Force and Force Ripple Reduction of PMLSM by Permanent Magnet Segmentation for Direct-Drive Servo System

Daeseon Cheo¹, Ho-Jin Oh¹, Jae-Hoon Cho¹, Chang Hyeon Wang¹, Jin Hwan Lee², and Sang-Yong Jung¹

¹Sungkyunkwan University, Korea, ²Chonnam National University, Korea

[WO2_03]

10:40–11:00

Analysis of Damping Characteristics of EDS Maglev with Linear Generator

Gang Lv and Wang Yu

Beijing Jiaotong University, China

[WO2_04]

11:00–11:20

Global Sensitivity Analysis of a Long-Stator Linear Synchronous Motor

Cheng Tian, Fei Ni, Lin Fan, and Lijun Rong

Tongji University, China