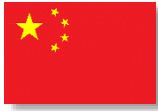


CONTENTS

| | |
|-----------------------------------|----|
| HISTORY OF THE IEEE SCEMS..... | 1 |
| ORGANIZERS | 2 |
| WELCOME MESSAGE | 3 |
| MESSAGE FROM HONORARY CHAIR | 4 |
| COMMITTEES..... | 6 |
| GENERAL INFORMATION..... | 9 |
| REGISTRATION | 10 |
| PRESENTATION GUIDELINES..... | 11 |
| PROGRAM AT A GLANCE | 12 |
| TECHNICAL PROGRAM OVERVIEW | 13 |
| VIRTUAL CONFERENCE PROGRAM | 15 |
| KEYNOTE SPEECHES..... | 16 |
| Oral Session A1 (EM & PE)..... | 19 |
| Oral Session B1 (EM)..... | 20 |
| Oral Session C1 (PE) | 21 |
| Oral Session A2 (PS)..... | 22 |
| Oral Session B2 (EM)..... | 23 |
| Oral Session C2 (PE) | 24 |
| Poster Session A3 (EM) | 26 |
| Poster Session B3 (PE) | 29 |
| Poster Session C3 (Others)..... | 31 |
| AUTHOR INDEX BY FIRST NAME..... | 33 |

HISTORY OF THE IEEE SCEMS

The 4th SCEMS



December 1-3, 2021
Huzhou, China



The 3rd SCEMS



December 4-6, 2020
Jinan, China



The 2nd SCEMS



November 1-3, 2019
Busan, Korea



The 1st SCEMS



December 14-16, 2018
Huzhou, China



ORGANIZERS

Sponsor

Zhejiang University IEEE Student Branch Industry Applications Society Chapter
(IEEE IAS SBC @ ZJU)

Technical Sponsor

IEEE Industry Applications Society

Co-Sponsors

College of Electrical Engineering, Zhejiang University
People's Government of Nanxun District
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Co-Organizers

Zhejiang Provincial Key Laboratory of Electrical Machine Systems
Huzhou Nanxun Jingchuan Institute of Smart Drives
Huzhou Nanxun Cooperative Innovation Center for Engineers of Smart Drives

Supporters



WELCOME MESSAGE

Dear Colleagues,

It is our great pleasure to welcome you to 2021 IEEE 4th Student Conference on Electric Machines and Systems (IEEE SCEMS 2021) which is organized by Zhejiang University IEEE Student Branch Industry Applications Society Chapter and will be held in Huzhou, China on Dec. 1-3, 2021, both onsite and online.

The IEEE SCEMS aims to provide a forum for students and youth researchers, scientists, and engineers to present their latest R&D achievements and to exchange information and experiences in the field of electrical machines and systems, including electrical machines of all types and all aspects (such as new structures, materials, and analysis and design methods), power electronic converters, motion control, electrical drive, and application systems, as well as other relevant areas.

Huzhou, where the conference will be held, is an ancient city with a history of over 2300 years. As one of the most renowned and delicate Chinese cities, Huzhou is well known for its beautiful natural reserves such as Mogan Mountain, Nanxun ancient town. Moreover, transportation to Huzhou is convenient, as it can be reached from Hangzhou or Shanghai within an hour.

We look forward to meeting you in Huzhou!



A handwritten signature in black ink that reads "Xue-Fei Qin". The signature is stylized and fluid.

Ms. Xue-Fei Qin
IEEE SCEMS 2021 General Chair
June 1, 2021

MESSAGE FROM HONORARY CHAIR

In May 2017, my students founded the IEEE Student Branch IAS Chapter at Zhejiang University, with the great encouragement and support from Dr Peter Magyar the IAS CMD Chair. I was very honored to be invited as the chapter's supervisor. Since then, the chapter has organized many technical events, and even won the IAS Outstanding New Chapter Award in 2018. In November 2017, Peter suggested the Chapter organize a student-led conference in Region-10, like those of the Club of the 6 in America, Europe and Africa. My students then established the IEEE Student Conference on Electric Machines and Systems (SCEMS), and organized the first SCEMS in 2018 in Huzhou, China. "The SCEMS 2018 was extraordinary excellent", concluded Peter in his email to me. I am hereby reviewing the history of the SCEMS, as I am really proud of my students for their excellent job. And, I am always grateful to Peter, Dr Tomy Sebastian the IAS president, and Prof Wei-Jen Lee the IAS president elected, who flew to China from Germany and USA to attend the 2018 conference, and to many IAS colleagues and staff such as Dr Tamas Ruzsanyi the IAS Meetings Department Chair, for their invaluable supports to the students and young professionals.



The second and third IEEE SCEMS were organized by the IAS Student Branch Chapters at Kyungshung University, Busan, Korea in 2019 and at Shandong University, Jinan, China in 2020, respectively. Both were very successful.

Since 2020, the COVID-19 pandemic has been changing the world in almost all aspects. Large in-person meeting becomes extremely difficult, and most technical conferences turn to the virtual mode. While foreseeing such difficulties, my students with the IAS Student Branch Chapter at Zhejiang University stood out again, to organize the fourth SCEMS in 2021. They have spent so much time, for setting up the webpage, calling for papers, collecting digests and full papers, inviting professors to review the digests / full papers, communicating with the authors and IEEE, seeking assistance from the university and local authorities, contacting industry supports, scheduling the conference program, preparing the conference proceedings, USB keys, certificates and many others... I can see their efforts, I can understand their diligence, I can even feel their anxiousness, and, I can observe their growth and maturing. I am impressed, so deeply, by these young students, especially by the conference general chair Miss Xue-Fei Qin and her co-chairs Mr Lei Yao, Mr Feng-Yuan Yu, Mr You-Hao Zhang and Mr Zhao-Peng Tang. Without their efforts and hard work, the SCEMS 2021 could never be successful, particularly during this pandemic. Of course, supports from the IAS, from Peter, Tamas, Tomy, Wei-Jen the current IAS president, Prof Chiara Boccaletti the current IAS Meetings Department Chair, and Ms Lesley Arakkal the current IAS CMD chair, are sincerely appreciated. Meanwhile, I would like to take this opportunity to thank all the co-sponsors, organizer and co-organizers, and industry supporters. Thanks are also due to the committee members and the keynote speakers, and of course to all the student authors and their supervisors, too.

As Xue-Fei said in her general chair's welcome message, the IEEE SCEMS aims to provide a forum for students and youth researchers, scientists, and engineers to present their latest R&D achievements and to exchange information and experiences in the field of electrical machines and systems. The SCEMS 2021 attracted more than 120 digests, and, after strict peer-review, accepted more than 80 full papers for oral and poster presentations. I would proudly say that these are rather good and appropriate numbers for a student-led conference, especially during the COVID-19 pandemic.

Moreover, I would like to mention that, although the pandemic situation was not stabilized in 2021, my students always aimed to organize an in-person conference so as to attract more attendees and to enhance the networking between the students and the industries. Around 170 participants from both academia and industry were expected. Nevertheless, due to the rapid change of the pandemic, they had to turn the conference to a hybrid one, with most student authors participating on line and some local student authors and industry participants gathering in person. However, just some hours before I am completing this message, new cases of COVID-19 were confirmed on the campus. Under this unexpected condition, while considering the health and safety of the participants, my students had to turn the SCEMS 2021 to the fully on-line mode. I do understand how upset they are because they actually have made everything ready for an in-person conference, but meanwhile I do believe, without any doubt, that they can ensure an unforgettable and fruitful on-line SCEMS 2021.

I wish my students and all the participants a very successful conference!



Prof Jian-Xin Shen
IEEE SCEMS 2021 Honorary Chair
November 25, 2021

COMMITTEES

Honorary Chairs

| | |
|---------------------|---------------------|
| Prof. Jian-Xin Shen | Zhejiang University |
| Prof. Wei-Jen Lee | IEEE-IAS |
| Ms. Lesley Arakkal | IEEE-IAS CMD |

General Chair

| | |
|-----------------|---------------------|
| Ms. Xue-Fei Qin | Zhejiang University |
|-----------------|---------------------|

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| Mr. Lei Yao | Zhejiang University |
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| Mr. Zhao-Peng Tang | Zhejiang University |

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| Prof. Tai-Ying Zheng | Zhejiang University |
| Dr. Yi Sun | Zhejiang University |

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| Prof. Yue Zhang | Shandong University |
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| Prof. Yu-Shan Cheng | Taiwan Ocean University |
| Prof. Kai Ni | Huazhong University of Science and Technology |
| Dr. Chen Hao | Nanyang Technological University |
| Dr. Shun Cai | Nanyang Technological University |
| Dr. Xing Qi | Anhui University |

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| Ms. Hong-Xia Cao | Zhejiang University |
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| Ms. Tian-Feng He | Zhejiang University |
| Ms. Wen-Jie Wan | Zhejiang University |
| Ms. Xiao-Yi Zhuang | Zhejiang University |

GENERAL INFORMATION

Dates

December 1-3 (Wednesday-Friday), 2021

Time Zone

Please be reminded that all the time shown in this program is based on CST (Chinese Standard Time) UTC+08:00 hours

Opening Ceremony

09:00-09:30, December 2 (Thursday)

Closing Ceremony and Awarding Ceremony

10:30-11:00, December 3 (Friday)

Broadcasting Platform

Tencent Meeting

Download Link: <https://meeting.tencent.com/download-center.html>

REGISTRATION

Registration Fee

| Category | | Fee | Fee Includes |
|----------|-------------------------------|--|---|
| A | IEEE Student Member | 990 RMB / 160 USD | All Technical Sessions, Conference Kit, Reception, Lunches, Banquet, Publication of 1 Paper. |
| B | Non-IEEE Student Member | 1190 RMB / 190 USD | |
| C | IEEE Member (non-student) | 1990 RMB / 320 USD | |
| D | Non-IEEE Member (non-student) | 2390 RMB / 380 USD | |
| E | Listener | 690 RMB / 110 USD | All Technical Sessions, Conference Kit, Reception, Lunches, Banquet. |
| Others | Additional Paper(s) | 800 RMB or 130 USD per paper. Maximum 2 additional papers per registrant. | |
| | Additional Page | Strictly limited. Maximum 8 pages per paper. | |

Attentions

1. Since the registration fee is very low, partly covering the basic expense only, **NO** discount of registration fee will be offered for the online presentations.
2. For each conference paper, the presenter should be registered as a speaker (Category A/B/C/D), any other author who wants to attend the conference should be registered as a listener (Category E).
3. Each author can register 1 paper with your regular registration (A/B/C/D), and **NO** more than 2 additional papers with extra pay (800 RMB or 130 USD each).
4. Submissions without author registration will be treated as no-show and will **NOT** be published in the conference proceedings or IEEE database.
5. Registration can **NOT** be cancelled once successful.
6. **ONLY** electronic VAT invoice can be provided.

PRESENTATION GUIDELINES

Oral Presentation

Each oral presentation will have **12 minutes for talk and 3 minutes for Q&A**. Oral presenters need to prepare a 12-minute pre-recorded oral presentation (in MP4 format) which can be generated from MS PowerPoint following the instructions in this link: <https://support.office.com/en-us/article/record-a-slide-show-with-narration-and-slide-timings-0b9502c6-5f6c-40ae-b1e7-e47d8741161c>. **The aspect ratio is 16:9.**

How the session will go

1. Click the link below to download **Tencent Meeting** on your computer in advance and participate in real time through Tencent Meeting.
<https://meeting.tencent.com/download-center.html>
2. Access Tencent Meeting at least 10 minutes before the start of the sessions to check the video and audio connection (Chinese Standard Time).
3. The session chair will introduce the presenter and play the pre-recorded presentation video.
4. After playing the video, take questions and answers in real time.
5. Session chairs have the responsibility of reporting "no-shows" to the Technical and Publication Committee (TPC). "No-show" papers will **NOT** be published in the conference proceedings or IEEE database.

Poster Presentation

Poster presenters need to prepare a digital poster in **A0 portrait format** (1189mm height, 841mm width). Title and authors' information **MUST** be included. Simply posting a copy of the paper is **NOT** appropriate and will be treated as a "no-show" situation.

How the session will go

1. Pre-submitted presentation file will be updated on our website and open throughout the conference dates (December 1-3, 2021)
2. Click the link below to download **Tencent Meeting** on your computer in advance and participate in real time through Tencent Meeting.
<https://meeting.tencent.com/download-center.html>
3. Access Tencent Meeting at least 10 minutes before the start of the sessions to check the video and audio connection (Chinese Standard Time).
4. The poster presenters **MUST** be available to answer questions raised by the session chair and attendance who joins the room during their session.
5. Session chairs have the responsibility of reporting "no-shows" to the Technical and Publication Committee (TPC). "No-show" papers will **NOT** be published in the conference proceedings or IEEE database.

PROGRAM AT A GLANCE

| | Dec. 1 (Wed.) | Dec. 2 (Thur.) | Dec. 3 (Fri.) |
|-------|--|---------------------------------------|---------------------------------------|
| 09:00 | Registration | Opening Ceremony Main Venue | Poster Session Room A, B, C |
| 10:00 | | Keynote Speeches Main Venue | Closing Ceremony Main Venue |
| 11:00 | | | Lunch |
| 12:00 | | | |
| 13:00 | | | |
| 14:00 | Industry Technical Exchange Session | Oral Sessions Room A, B, C | |
| 15:00 | Banquet | Dinner | |
| 16:00 | | | |
| 17:00 | | | |
| 18:00 | | | |

TECHNICAL PROGRAM OVERVIEW

| December 2 (Thursday) | | | |
|-----------------------|--|---|---|
| | Room A | Room B | Room C |
| | Main Venue | | |
| 09:00-09:30 | Opening Ceremony | | |
| 09:30-10:15 | Keynote Speech 1 (Dong Wang) | | |
| 10:30-11:15 | Keynote Speech 2 (Alf Kåre Ådhanes) | | |
| 11:15-12:00 | Keynote Speech 3 (Kan Akatsu) | | |
| 13:30-15:15 | Oral Session A1 Permanent Magnet Machines / Motor Control and Motor Drives P19 | Oral Session B1 Permanent Magnet Machines / Induction and Synchronous Machines P20 | Oral Session C1 Motor Control and Motor Drives / Automotive Power Electronics and Chargers P21 |
| 15:45-17:30 | Oral Session A2 Renewable Energy Generation / Power System P22 | Oral Session B2 Linear and Special Machines / Magnetics and Field Analysis P23 | Oral Session C2 Sensorless Control / Switched Reluctance Motors P24 |

| December 3 (Friday) | | | |
|---------------------|-------------------------|--|---|
| | Main Venue | Room A | Room B |
| | | Poster Session A3 Permanent Magnet Machines / Induction and Synchronous Machines / Linear and Special Machines / Transformers and Power Apparatus / Magnetic and Insulation Materials P26 | Poster Session B3 Motor Control and Motor Drives / Motion Control and Servo Systems / Sensorless Control P29 |
| 09:00-10:15 | | | Poster Session C3 Other Areas in Power Electronics and Motor Drives / Switched Reluctance Motors / Renewable Energy Generation / Energy Storage Technologies / Power Systems P31 |
| 10:30-11:00 | Closing Ceremony | | |

VIRTUAL CONFERENCE PROGRAM

Main Venue

Opening Ceremony | 09:00-09:30, December 2 (Thursday)

Keynote Speeches | 09:30-12:00, December 2 (Thursday)

Closing Ceremony | 10:30-11:00, December 3 (Friday)

Tencent Meeting Link: <https://meeting.tencent.com/dm/lhF1MLa9jBqy>

Tencent Meeting ID: 516-1748-9714



Room A

Test Session A0 | 15:00-16:00, November 30 (Tuesday)

Oral Session A1 | 13:30-15:15, December 2 (Thursday)

Oral Session A2 | 15:45-17:15, December 2 (Thursday)

Poster Session A3 | 09:00-10:15, December 3 (Friday)

Tencent Meeting Link: <https://meeting.tencent.com/dm/PsQLqhFoNB14>

Tencent Meeting ID: 531-5983-7787



Room B

Test Session B0 | 15:00-16:00, November 30 (Tuesday)

Oral Session B1 | 13:30-15:15, December 2 (Thursday)

Oral Session B2 | 15:45-17:00, December 2 (Thursday)

Poster Session B3 | 09:00-10:15, December 3 (Friday)

Tencent Meeting Link: <https://meeting.tencent.com/dm/FsAeFdkwjWmh>

Tencent Meeting ID: 866-6971-7975



Room C

Test Session C0 | 15:00-16:00, November 30 (Tuesday)

Oral Session C1 | 13:30-15:15, December 2 (Thursday)

Oral Session C2 | 15:45-17:30, December 2 (Thursday)

Poster Session C3 | 09:00-10:15, December 3 (Friday)

Tencent Meeting Link: <https://meeting.tencent.com/dm/Ka3ZsY89C9oe>

Tencent Meeting ID: 798-6813-9653



We strongly recommend each presenter join your test session to make sure your presentation can be proceeded properly.

KEYNOTE SPEECHES

"Motor system in all-electric mobile platform"

Dong Wang

Naval University of Engineering, Professor



Abstract

In recent years, development of power electronics and AC motor technology has promoted the profound change of power system from mechanization to electrification, spawned all-electric mobile platforms such as all-electric vessels, all-electric vehicles and all-electric / more-electric aircrafts, and accelerated the development of a series of technologies such as efficient renewable energy utilization, high-performance electric machines and drives, as well as intelligent control. This lecture introduces the demand characteristics of all-electric mobile platforms such as all-electric vessels, all-electric vehicles, and all-electric / more-electric aircraft, summarizes the development trend and technology frontier, and discusses the key technologies and bottlenecks of the motor system in the all-electric mobile platform.

Biography

Dong Wang was born in Wuhan, China, in 1978. He received the B.S. and Ph.D. degrees in electrical engineering from Naval University of Engineering, Wuhan, China, in 2000 and 2007, respectively. He is currently a professor and a supervisor for Ph.D. candidates with Naval University of Engineering. His research interests include electric propulsion and integrated power generation systems.

"Sustainable shipping — electric propulsion enables future proof ships with tangible benefits already now"

Alf Kåre Ådnanes

ABB Marine & Ports,
Regional Manager AMEA (Asia, Middle East and Africa)



Abstract

Electric propulsion is not a new concept; the first vessels were already electrified for more than 100 years ago.

It gained a solid foothold during the 1990's, mainly in passenger and offshore oil and gas segment. Safety, comfort, and maneuverability were the initial drivers, and gradually fuel savings got more importance as fuel became a bigger share of the operating costs.

During recent years, emissions and climate changes have escalated to the top of political and social agenda, and all industries needs to respond to those with plans and actions to set up a path towards carbon neutrality.

For shipping, the 174 member states of the International Maritime Organization (IMO) have agreed to set ambitious targets for CO₂ emissions: at least 40% reduction of carbon intensity in 2030 increasing 70% in 2050, with 2008 as baseline.

The targets can only be met by a disruptive way on how ships are designed, operated, and change to carbon neutral fuels. Electric and hybrid propulsion will be one of the solutions that can integrate and use new energy sources and energy carriers that are under development or even not known yet.

In this presentation, I will show how electric propulsion as we know today is a futureproofing concept, considering that ships are typically in operation for 20 or more years. Further, electric propulsion is also providing gain from day one in operation performance and economy.

Biography

Alf Kåre Ådnanes first joined ABB in 1991. He has worked in various positions including corporate research, marine engineering and projects delivery, product management and development, and technology management for the global marine business. He was ABB Marine & Ports China General Manager from 2016 to 2020. Starting from 2021, he is appointed as Regional Manager for ABB Marine & Ports AMEA (Asia, Middle East and Africa).

Alf Kåre holds MSc and PhD in Electrical Engineering from the Norwegian University of Science and Technology.

"Integration technology of electric machines and inverter system in EV"

Kan Akatsu

Yokohama National University, Professor



Abstract:

Especially in the field of the power train of Electric Vehicle and Hybrid electric vehicle, the power train consist of electric machine and inverter, sometimes including the reduction gears, is required not only high efficiency but also high power density and high torque density. The integration technique the electric machine with the inverter is one of the key technologies to realize compact, light, highly efficient system. In the presentation, I explain about some technique to integrate them in the viewpoint of the machine design, inverter design, and thermal design.

Biography

Kan Akatsu received B.S., M.S., and Ph. D degrees in electrical engineering from Yokohama National University, Yokohama, Japan, in 1995, 1997, 2000 respectively.

He joined Nissan Research Center, Yokosuka, Japan, in 2000, he contributed to the design and analysis of the new concept permanent magnet machines. In 2003, he joined the department of Electrical and Electric Engineering at Tokyo University of Agriculture and Technology, Tokyo, Japan, as an assistant professor. From 2005 to 2007, he is a JSPS Postdoctoral Fellowship for Research Abroad, visiting professor in WEMPEC (Wisconsin Electric Machines and Power Electronics Consortium), University of Wisconsin-Madison. From 2009, he was an associate professor, and he was a full professor in Shibaura Institute of Technology, Tokyo, Japan. From October 2019, he is a professor in Yokohama National University.

Oral Session A1 (EM & PE)

13:30-15:15, December 2 (Thursday)

Room A

Tencent Meeting ID: 531-5983-7787



Topics: Permanent Magnet Machines Motor Control and Motor Drives

Chairs Mr. Zhao-Peng Tang (Zhejiang University)
Ms. Wen-Jie Wan (Zhejiang University)

EM-045 Generalized Analysis of Armature Windings MMF Harmonics

13:30-13:45 Ze-Zheng Wu^{1,2}, Jian-Xin Shen^{1,2}

¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

EM-046 Coupled Thermo-Mechanical Stress Analysis of Insulation in Deep-Sea Oil-Filled Motors

13:45-14:00

Rui Wang, Lingfeng Cai, Jian Zhang, Xiaoyan Huang, Youtong Fang
Zhejiang University, China

EA-007 A Position Control Based on Active Disturbance Rejection Controller Considering Parameter Variations of Harmonic Drive Gear Systems

14:00-14:15

Xi Zeng, Yilin Ma, Huan Yang
Zhejiang University, China

PE-043 Synchronous Optimal Torque PWM with Low Torque Ripple under Low Carrier Ratio

14:15-14:30

Zhihao Song¹, Wenxi Yao¹, Senqing Zhuo², Wuhua Li¹

¹Zhejiang University, China, ²Ningbo Aux Electric Co., Ltd., China

PE-044 Common-Mode Resonance Suppression Strategy in High-Speed Compressor Drive

14:30-14:45

Can Sun^{1,2}, Huan Yang^{1,2}, Bo Qu³, Li Xiang⁴

¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China, ³Zinsight Technology Co., Ltd., China, ⁴Nanjing University of Aeronautics and Astronautics, China

PE-046 A Novel Complex Vector Decoupling Control Method of IPMSM with Fuzzy Strategy

14:45-15:00

Qidi Shen, Hongyi Yang, Xiaoyan Huang, Feiyu Chen

Zhejiang University, China

PE-054 Current-Loop Bandwidth Extension for PMSM Servo System Based on SiC Inverter and FPGA

15:00-15:15

Qiwei Xie, Jianqi Qiu

Zhejiang University, China

Oral Session B1 (EM)

13:30-15:15, December 2 (Thursday)

Room B

Tencent Meeting ID: 866-6971-7975



Topics: Permanent Magnet Machines Induction and Synchronous Machines

Chairs Mr. Zi-Ang Zhu (Zhejiang University)
Ms. Tian-Feng He (Zhejiang University)

EM-016 Sensitivity Analysis and Multi-objective Optimization of a PM-Assisted Synchronous Reluctance Motor with Rectangular Flux-Barriers

13:30-13:45

Yuhang Cheng, Yawei Wang, Dawei Li, Ronghai Qu
Huazhong University of Science & Technology, China

EM-037 The Structure of Symmetrical Stator Core Offset to Reduce Cogging Torque

13:45-14:00

Tao Zhou, Li Zhu
Shanghai Jiao Tong University, China

EM-052 Effect of Slot Number on Performances of a Single-Side Axial-Flux Permanent Magnet Generator

14:00-14:15

Chun-Yu Hsiao, Ketut Wirtayasa
National Taiwan University of Science and Technology

EM-011 Rotor Unbalanced Magnetic Pull Characteristics Properties in Synchronous Generators Due to Dynamic Air-gap Eccentricity Faults

14:15-14:30

Kai Sun, Yuling He, Minghao Qiu, Shuo Wang, Wenhao Zhang
North China Electric Power University, China

EM-012 Effect of Rotor Interturn Short circuit degree and position on Stator Circulating Current inside Parallel Branches in Generators

14:30-14:45

Ming-xing Xu, Yu-ling He, De-rui Dai, Xiang-ao Liu, Wen-jie Zheng, Wen Zhang
North China Electric Power University, China

EM-013 Detection of Ending Winding Wear Regulation Acting by Electromagnetic Force in Synchronous Generators under both SISC and SAGE Conditions

14:45-15:00

Wen Zhang, Yu-Ling He, Yong Li, Ming-Xing Xu, De-Rui Dai
North China Electric Power University, China

EM-015 Design of Synchronous Reluctance Motors with Asymmetrical Flux Barriers for Torque Ripple Reduction

15:00-15:15

Xuan Li, Yawei Wang, Ronghai Qu
Huazhong University of Science & Technology, China

Oral Session C1 (PE)

13:30-15:15, December 2 (Thursday)

Room C

Tencent Meeting ID: 798-6813-9653



Topics: Motor Control and Motor Drives Automotive Power Electronics and Chargers

Chairs Mr. Yu-Chao Fang (Zhejiang University)
Mr. Jin-Hui Ye (Zhejiang University)

PE-004 Common Mode Electromagnetic Interference Source Characteristics of SiC MOSFETs
in Motor Drives

13:30-13:45

Yameng Chai, Xiaofeng Ding
Beihang University, China

PE-010 Variable Parameter PI Control based on Fuzzy Logic Strategy for Dual-Winding PMSM

13:45-14:00

Mingkai Cui, Yanjun Yu
Harbin Institute of Technology, China

PE-019 Improved PI Regulator with Integral Separation for Permanent Magnet Synchronous
Motor Control

14:00-14:15

Zewen Huang, Yulong Liu
Huaqiao University, China

PE-020 Active Disturbance Rejection Current Control for Synchronous Reluctance Motor

14:15-14:30

Zibo Li, Libing Zhou, Jin Wang
Huazhong University of Science and Technology, China

PE-031 High quality Open-circuit Fault Tolerant Control of a Bi-harmonic Seven-Phase
Permanent Magnet Synchronous Machine

14:30-14:45

Y. Zhu¹, J. Gong¹, J. Huang¹, F. Tan¹, W.Tian¹, N-k. Nguyen², E. Semail²
¹Shandong University, China, ²Univ. Lille, France

PE-032 An Enhanced SVPWM Method of Suppressing Common-Mode Voltage in Dual Three-
Phase Motor

14:45-15:00

Bohu Zhang, Hao Hua, Zicheng Zhou
Shanghai Jiao Tong University, China

PE-002 Design and Simulation of a Rectifier for Bidirectional Electric Vehicle Chargers

15:00-15:15

Omes J. Bajwa, Shujun Zhang
West Norway University of Applied Sciences, Norway

Oral Session A2 (PS)

15:45-17:15, December 2 (Thursday)

Room A

Tencent Meeting ID: 531-5983-7787



Topics: Renewable Energy Generation Power System

Chairs Ms. Hong-Xia Cao (Zhejiang University)
Mr. Pei-Yi Li (Zhejiang University)

PS-006 Short-term Frequency Support Method for a Single-stage Photovoltaic Generator based on Residual Voltage Control

15:45-16:00

Zheng Fan^{1,2}, Wei Chen^{1,2}, Taiying Zheng^{1,2}

¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

PS-010 Comparative Analysis of Inertia Control Methods for a PMSG-Based Wind Turbine Generator

16:00-16:15

Jingze Qian^{1,2}, Wei Chen^{1,2}, Taiying Zheng^{1,2}

¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

PS-007 Inrush Suppression Method of Transformer in an Offshore Power System

16:15-16:30

Xingchao Jiao^{1,2}, Wei Chen^{1,2}, Taiying Zheng^{1,2}

¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

PS-002 Power Grid Disturbance Prediction and Analysis Method Based on SIR Model

16:30-16:45

Cheng Qian, Aiyuan Wang

Shanghai Dianji University, China

PS-013 Quantification Index of Voltage Stability Based on Physical Mechanism of Reactive Power Distribution

16:45-17:00

Haoliang Jiang, Hengxu Zhang

Shandong University, China

PS-014 Research on Correlation Analysis of Power User Behavior Based on Coupled Meteorological Factors

17:00-17:15

Yixiao Li¹, Tianguang Lv¹, Xin Zhao², Jiyan Liu³, Wenjie Ju³, Wanlei Xue²

¹Shandong University, China, ²Economic & Technology Research Institute of State Grid Shandong Electric Power Company, China, ³State Grid Shandong Electric Power Company, China

Oral Session B2 (EM)

15:45-17:00, December 2 (Thursday)

Room B

Tencent Meeting ID: 866-6971-7975



Topics: Linear and Special Machines Magnetics and Field Analysis

Chairs Mr. Jian Chen (Zhejiang University)
Mr. Chao-Rui Yang (Zhejiang University)

EM-014 A Novel Hybrid Excited Machine with DC Bias and Magnetic-Saturation-Alleviation

15:45-16:00 Siwei Zhang, Yulong Liu, Zewen Huang
Huaqiao University, China

EM-029 Influence of Virtual Pole on Electromagnetic Characteristics and Equivalent Pole Pitch of Modular-secondary PMSLM

16:00-16:15 Jing Li, Xuzhen Huang, Bo Zhou
Nanjing University of Aeronautics and Astronautics, China

EM-036 Investigation of Variable Flux Memory Machines with Hybrid Connected Delta-Type Permanent Magnets

16:15-16:30 Zicheng Zhou, Hao Hua, Bohu Zhang
Shanghai Jiao Tong University, China

EM-028 A Capacitance Matrix Expansion Method for Parasitic Capacitance Extraction of Excitation Winding

16:30-16:45 Zezhong Chen¹, Renhua Jiang², Shushu Zhu¹, Yaohua Hu³
¹Nanjing University of Aeronautics and Astronautics, China, ²AVIC Leihua Electronic Technology Research Institute, China, ³Aviation Key Laboratory of Science and Technology on Aero Electromechanical System Integration, China

EM-031 General Analysis of Combinations of High Frequency Injected Auxiliary Coils in Displacement Sensorless Control

16:45-17:00 Yi Zhang, Yu Wang, Cheng-Gao Zhang, Wen-Juan Hao
Nanjing University of Aeronautics and Astronautics, China

Oral Session C2 (PE)

15:45-17:30, December 2 (Thursday)

Room C

Tencent Meeting ID: 798-6813-9653



Topics: Sensorless Control Switched Reluctance Motors

Chairs Mr. Zhang-Hao Huang (Zhejiang University)
Ms. Xiao-Yi Zhuang (Zhejiang University)

PE-013 Maximum Inductance Detection-based Fault-Tolerant Sensorless Control for SRM Drive
15:45-16:00

Qingguo Sun, [Tianze Lan](#)
Hebei University of Technology, China

PE-024 On-line Suppression of Harmonic Currents Caused by Inverter Non-linearity for Sensorless Control of PMSMs
16:00-16:15

[Dongdong Chen](#)¹, [Jin Wang](#)¹, [Fangyong Tian](#)², [Libing Zhou](#)¹
¹*Huazhong University of Science and Technology, China*, ²*Research Institute of Petroleum Engineering of Zhongyuan Oilfield, China*

PE-030 Sensorless Control of a Seven-phase Non-sinusoidal Permanent Magnet Synchronous Machine Using High Frequency Signal Injection Method
16:15-16:30

[Y. Huang](#)¹, [J. Gong](#), [Y. Zhu](#)¹, [F. Tan](#)¹, [W. Tian](#)¹, [E. Semail](#)², [N-k. Nguyen](#)²
¹*Shandong University, China*, ²*Univ. Lille, France*

PE-039 An Improved Type-2 Phase-Locked Loop -Based Sliding Mode Observer for Sensorless Control of SPMSM
16:30-16:45

[Abd Alrahman Dawara](#)¹, [Zhe Chen](#)¹, [Xuxuan Zhang](#)¹, [Hang Zhang](#)², [Guangzhao Luo](#)¹, [Ralph Kennel](#)³
¹*Northwestern Polytechnical University, China*, ²*Xi'an University of Technology, China*, ³*Technical University of Munich, Germany*

PE-014 An Advanced Boost Chopper Converter-Based Direct Instantaneous Torque Control for SRMs
16:45-17:00

Qingguo Sun, [Hantong Xie](#)
Hebei University of Technology, China

PE-015 Modular Converter-Based Predictive Current Control of SRM for Torque Ripple Suppression
17:00-17:15

Qingguo Sun, [Limei Chen](#), [Gongmin Wei](#)
Hebei University of Technology, China

PE-028

Comparison and analysis of two power topologies for four-phase SRM

17:15-17:30

Yuwei Zhu, Yutai Mao, Peilin Liu, Chuang Liu, Yujie Qian, Xuezhong Zhu

Nanjing University of Aeronautics and Astronautics, China

Poster Session A3 (EM)

09:00-10:15, December 3 (Friday)

Room A

Tencent Meeting ID: 531-5983-7787



Topics: Permanent Magnet Machines
Induction and Synchronous Machines
Linear and Special Machines
Transformers and Power Apparatus
Magnetic and Insulation Materials

Chairs Mr. Jin-Hui Gao (Zhejiang University)
Mr. Kai Luo (Zhejiang University)

EM-005 Design of a Novel Stator Water-cooling System for Yokeless and Segmented Armature Axial Flux Machine

Wei Le, Mingyao Lin, Lun Jia, Shuai Wang
Southeast University, China

EM-018 Torque Calculation of PMA-SynRM Using the Magnetic Equivalent Circuit

Zaixun Ling¹, Kang Shuai², Cheng Cheng¹, Hao Chen², Jingwen Zheng¹, Jin Wang²
¹State Grid Hubei Electric Power Co., Ltd., China, ²Huazhong University of Science and Technology, China

EM-032 Analysis of Flux Leakage in Slot and Circulating Current Loss of PMSM with Concentrated Winding

Jing Wang¹, Dongxu Liu¹, Qiang Li¹, Weiwei Geng¹, Lei Li¹, Zhuoran Zhang²
¹Nanjing University of Science and Technology, China, ²Nanjing University of Aeronautics and Astronautics, China

EM-034 Thermal and Stress Analysis for a High-speed Permanent Magnet Motor with Solid Rotor

Zhenning Qi¹, Yue Zhang¹, He Zhang², Xiuhe Wang¹, Huijun Wang³, Lei He¹
¹Shandong University, China, ²University of Nottingham Ningbo, China, ³Beihang University, China

EM-035 Thermal Design and Simulation of winding cooling for permanent magnet synchronous motor of electric vehicle

Yujun Guo, Aiyuan Wang
Shanghai Dianji University, China

EM-042 Comparison of Rotor Strength of Various Rotor Structures for Ultra-high-speed Permanent Magnet Synchronous Motor

Tao Pu¹, Guanghui Du¹, Jun Tong¹, Na Huang², Niumei Li¹, Wei Xu³

¹*Xi'an University of Science and Technology, China*, ²*Xi'an Yonge Jieli Wind Energy Co. Ltd, China*, ³*Huazhong University of Science and Technology, China*

EM-043 Comparison of Different Rotor Sleeves of High-speed Permanent Magnet Synchronous Motors Based on Multi-physics

Lu Wang¹, Guanghui Du¹, Jun Tong¹, Na Huang², Chengshuai Hu¹, Wei Xu³

¹*Xi'an University of Science and Technology, China*, ²*Xi'an Yonge Jieli Wind Energy Co. Ltd, China*, ³*Huazhong University of Science and Technology, China*

EM-009 Thermal Management of Open Air-cooled Induction Motor for Drilling

Ziyi Xu¹, Yongming Xu², Mengmeng Ai¹, Wenhui Liu¹, Yaodong Wang³

¹*Harbin University of Science and Technology, China*, ²*Changzhou Institute of Technology, China*, ³*Durham University, U.K.*

EM-017 Design and Analysis of a Novel Integrated Starter-Generator Based on Brush DC Motor

Caiyong Ye¹, Kailun Du¹, Kaifeng Liu¹, Jianping Zhang¹, Yu Xiang¹, Ling Qin²

¹*Huazhong University of Science and Technology, China*, ²*Jiang Su Huayuan Explosion-Proof Motor Co., China*

EM-019 Optimum Design of Single Phase Induction Motor with Copper Rotor Based on Improved Polyhedron Method

Caiyong Ye¹, Kailun Du¹, Kaifeng Liu¹, Yang Zhao¹, Jianping Zhang¹, Ling Qin²

¹*Huazhong University of Science and Technology, China*, ²*Jiang Su Huayuan Explosion-Proof Motor Co., China*

EM-050 Torque Analysis and Optimization of Synchronous Reluctance Motor Shielded by Magnetic Stator Can

Bowen Li^{1,2}, Hui Li^{1,2}, Xuwei Xiang^{1,2}

¹*Chongqing University, China*, ²*State Key Laboratory of Power Transmission Equipment & System Security and New Technology, China*

EM-020 Design of Consequent Pole Permanent Magnet Vernier Motor for Downhole Electric Drilling System

Zheng Chen¹, Jin Wang¹, Zhijian Hu², Jianqiu Xiao², Libing Zhou¹, Hu Wang¹

¹*Huazhong University of Science and Technology, China*, ²*CNPC Engineering Technology R&D Company Limited, China*

EM-027 Thermal Analysis of a Hybride Excitation Flux-Switching Motor with Water-Cooling System

Shunjie Ni¹, Lihua Zhou², Hao Li¹, Ruiwu Cao¹

¹Nanjing University of Aeronautics and Astronautics, China, ²AVIC Nanjing Engineering Institute of Aircraft System, China

EM-044 Analytical calculation of Permanent Magnet Flux Linkage and Winding Inductance of Mover Permanent Magnet Double Salient Reluctance Linear Machines

Huixian Zhang, Gaoqi Chen, Kunlun Zhang

Southwest Jiaotong University, China

EM-021 Study on the Pulse Transformer with energy recovery for Repetitive Pulsed High Magnetic Field

Shan Jiang, Heng Hu, Shuang Wang, Jinqiao Cheng, Tao Peng

Huazhong University of Science and Technology, China

EM-025 Calculation of the Core Loss of High-Frequency High-Voltage Transformer Considering the Influence of Temperature

Jinqiao Chen, Heng Hu, Shan Jiang, Le Deng, Tao Peng

Huazhong University of Science and Technology, China

EM-022 A New System for Calibrating a Pulsed Field Magnetometer

Heng Hu, Jinqiao Chen, Shan Jiang, Tao Peng

Huazhong University of Science and Technology, China

EM-039 Study on Characteristics of Silicon Steel Sheet and Core of PMSM Used in Deep Sea

Zhibo Chen, Xiang Luo

Shanghai Jiao Tong University, China

EM-047 Mechanical properties of transformer insulations under DC bias condition

Jing Wu¹, Jie Xu¹, Weiyan Zheng¹, Ming Jin¹, Xueqian Huang², Guoping Zou²

¹Zhejiang Dayou Industrial Co., Ltd., China, ²Zhejiang University, China

Poster Session B3 (PE)

09:00-10:15, December 3 (Friday)

Room B

Tencent Meeting ID: 866-6971-7975



Topics: **Motor Control and Motor Drives**
Motion Control and Servo Systems
Sensorless Control

Chairs Ms. Chen-Yue Zhang (Zhejiang University)
Ms. Chen-Xin Jiang (Zhejiang University)

PE-005 A Novel Stator Resistance Online Identification method based on ADRC
Shuai Wang, Mingyao Lin
Southeast University, China

PE-006 An Improved Robust Deadbeat Predictive Current Control without Computational Delay
Xie Wu, Yunkai Huang, Fei Peng
Southeast University, China

PE-018 Multi-parameter identification of permanent magnet synchronous motor based on improved grey wolf optimization algorithm
Jinmei Jiang, Zhu Zhang
Hunan University of Science and Technology, China

PE-021 Research on Predictive Current Suspension Control of Permanent Magnet Bearingless Motor
Yang Zhao, Caiyong Ye, Yongzihao Dai, Kaifeng Liu, Sifeng Zhao, Cong Deng
Huazhong University of Science and Technology, China

PE-022 Study on Control Strategy for PMSM Fed by Differential Boost Inverter
Hu Wang, Jin Wang, Libing Zhou
Huazhong University of Science and Technology, China

PE-023 The High Efficiency Control Method of PMSMs Based on Gradient Descent Algorithm
Zaixun Ling¹, Hao Chen², Cheng Cheng¹, Kang Shuai², Jingwen Zheng¹, Jin Wang²
¹State Grid Hubei Electric Power Co., Ltd., China, ²Huazhong University of Science and Technology, China

PE-026 Research on the Observation of the Rotor Flux Linkage Considering the Distribution of Rotor Current for Vector Control of Solid Rotor Induction Motors
Dongkai Jiang, Zhiquan Deng
Nanjing University of Aeronautics and Astronautics, China

PE-033 A Current Harmonic Suppression Strategy for Electrolytic Capacitor-less Drive System of PMSM Based on Resonant Controller

Li Lei, Xiang Luo, Li Zhu

Shanghai Jiao Tong University, China

PE-034 Research on Minimum Switching Loss SVPWM Control of Dual Three-Phase PMSM

Zhibo Chen, Xiang Luo

Shanghai Jiao Tong University, China

PE-035 A Current Harmonic Suppression Method of PMSM Based on Resonant Controller and Asymmetric-SVPWM Strategy

Li Lei, Xiang Luo, Li Zhu

Shanghai Jiao Tong University, China

PE-037 A Modified Method for Initial Rotor Position Detection of Brushless DC Motor Based on Voltage Vector Injection

Lu Zhou¹, Xinmin Li², Wei Chen², Tingna Shi³

¹Tianjin University, China, ²Tianjin Engineering Center of Electric Machine System Design and Control, China, ³Zhejiang University, China

PE-049 An Energy-Optimal Reference Trajectory with Iterative Learning-Based Control

Tong Zhou^{1,2}, Hui Li^{1,2}, Xuewei Xiang^{1,2}

¹Chongqing University, China, ²State Key Laboratory of Power Transmission Equipment & System Security and New Technology, China

PE-016 Parameter Estimation Using Improved Adaline Neural Network for Sensorless Control of IPMSM

Bi Wu, Derong Luo, Mengqiu Li, Qiang Zhou

Hunan University, China

Poster Session C3 (Others)

09:00-10:15, December 3 (Friday)

Room C

Tencent Meeting ID: 798-6813-9653



Topics: Other Areas in Power Electronics and Motor Drives
Switched Reluctance Motors
Renewable Energy Generation
Energy Storage Technologies
Power Systems

Chairs Ms. Yu-Xin Zhang (Zhejiang University)
Ms. Xiao-Yi Zhuang (Zhejiang University)

PE-052 Motor bearing fault diagnosis based on multi-feature fusion and PSO-BP

Yi Zhang, Jianfeng Qu, Xiaoyu Fang, Guojian Luo
Chongqing University, China

EA-004 A Fuzzy plus Integral Composite Control Strategy of Switched Reluctance Motor for Electric Vehicles

Fan Liu, Yuwei Zhu, Peilin Liu, Chuang Liu, Yujie Qian
Nanjing University of Aeronautics and Astronautics, China

EM-030 Research on the Effect of Winding Connection Modes on Radial Force and Vibration of Two-Phase SRM

Yujie Qian¹, Chuang Liu¹, Shiwei Yan², Fan Liu¹
¹Nanjing University of Aeronautics and Astronautics, China, ²Jiangsu Leili Motor Co., Ltd, China

PE-011 Modified Fault Diagnosis Method of Power Converter in SRM Based on Bridge Current Reconstruction Scheme

Debo Sun^{1,2}, Yanfang Hu^{1,2}, Zhiyong Kang^{1,2}
¹Hebei University of Technology, China, ²State Key Laboratory of Reliability and Intelligence of Electrical Equipment, China

PE-012 Multi-mode Drive Control System of Switched Reluctance Motor Based on a Novel N+2 Power Converter

Zhiyong Kang^{1,2}, Yanfang Hu^{1,2}, Debo Sun^{1,2}
¹Hebei University of Technology, China, ²State Key Laboratory of Reliability and Intelligence of Electrical Equipment, China

EA-002 MPPT Control Strategy of Variable Speed Hydropower System Based on Improved Fuzzy Control

Qiang Zhou, Derong Luo, Litao Dai, Bi Wu, Hongjun Luo
Hunan University, China

PS-012 Design of Variable Speed Constant Frequency Small Hydropower System

Hongjun Luo, Derong Luo, Litao Dai, Qiang Zhou
Hunan University, China

EA-006 Novel Decoupling Control and Eigenstructure Assignment Strategies for Rigid Active Magnetic Bearing Rotor System

Yuanwen Li, Changsheng Zhu
Zhejiang University, China

PS-004 The State Evaluation of Power Transformers Based on Grey Target Theory And Simulated Annealing

Lin Yao¹, Dingyong Liu¹, Shaowei Rao², Guoping Zou², Yu Du³, Yang Liu³, Shiyong Yang²
¹Daya Bay Nuclear Power Operation and Management Company, China, ²Zhejiang University, China, ³Suzhou Nuclear Power Research Institute, China

PS-005 Power Quality Test Data Processing and Comprehensive Analysis Software Design

Guoxin Li, Linyun Li, Sizheng Yu
China University of Mining and Technology, China

PS-008 Integration of a Protection/Measurement Current Transformer based on Compensation Algorithm

Jingmao Wen^{1,2}, Wei Chen^{1,2}, Xingchao Jiao^{1,2}, Min Wu^{1,2}, Taiying Zheng^{1,2}
¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

PS-009 Simplified Analysis of the Influence Scope of DC Magnetic Bias

Shanzhong Ju^{1,2}, Wei Chen^{1,2}, Taiying Zheng^{1,2}
¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

PS-011 Research on Self-excitation Overvoltage of Offshore Interconnected Power System

Jiawei Liu^{1,2}, Wei Chen^{1,2}, Xinchao Jiao^{1,2}, Taiying Zheng^{1,2}
¹Zhejiang University, China, ²Zhejiang Provincial Key Laboratory of Electrical Machine Systems, China

AUTHOR INDEX BY FIRST NAME

| Author | Paper-ID | Page | Author | Paper-ID | Page |
|---------------------|----------|------|---------------|----------|------|
| A | | | | EA-002 | 32 |
| Abd Alrahman Dawara | PE-039 | 24 | | PS-012 | 32 |
| Aiyuan Wang | PS-002 | 22 | De-Rui Dai | EM-012 | 20 |
| | EM-035 | 26 | | EM-013 | 20 |
| B | | | Dingyong Liu | PS-004 | 32 |
| Bi Wu | PE-016 | 30 | Dongdong Chen | PE-024 | 24 |
| | EA-002 | 32 | Dongkai Jiang | PE-026 | 29 |
| Bo Qu | PE-044 | 19 | Dongxu Liu | EM-032 | 26 |
| Bo Zhou | EM-029 | 23 | E | | |
| Bohu Zhang | PE-032 | 21 | E. Semail | PE-031 | 21 |
| | EM-036 | 23 | | PE-030 | 24 |
| Bowen Li | EM-050 | 27 | F | | |
| C | | | F. Tan | PE-031 | 21 |
| Caiyong Ye | EM-017 | 27 | | PE-030 | 24 |
| | EM-019 | 27 | Fan Liu | EA-004 | 31 |
| | PE-021 | 29 | | EM-030 | 31 |
| Can Sun | PE-044 | 19 | Fangyong Tian | PE-024 | 24 |
| Changsheng Zhu | EA-006 | 32 | Fei Peng | PE-006 | 29 |
| Cheng Cheng | EM-018 | 26 | Feiyu Chen | PE-046 | 19 |
| | PE-023 | 29 | G | | |
| Cheng Qian | PS-002 | 22 | Gaoqi Chen | EM-044 | 28 |
| Cheng-Gao Zhang | EM-031 | 23 | Gongmin Wei | PE-015 | 24 |
| Chengshuai Hu | EM-043 | 27 | Guanghui Du | EM-042 | 27 |
| Chuang Liu | PE-028 | 25 | | EM-043 | 27 |
| | EA-004 | 31 | Guangzhao Luo | PE-039 | 24 |
| | EM-030 | 31 | Guojian Luo | PE-052 | 31 |
| Chun-Yu Hsiao | EM-052 | 20 | Guoping Zou | EM-047 | 28 |
| Cong Deng | PE-021 | 29 | | PS-004 | 32 |
| D | | | Guoxin Li | PS-005 | 32 |
| Dawei Li | EM-016 | 20 | H | | |
| Debo Sun | PE-011 | 31 | Hang Zhang | PE-039 | 24 |
| | PE-012 | 31 | Hantong Xie | PE-014 | 24 |
| Derong Luo | PE-016 | 30 | Hao Chen | EM-018 | 26 |

| Author | Paper-ID | Page | Author | Paper-ID | Page |
|----------------|----------|------|-----------------|----------|------|
| | PE-023 | 29 | | PE-023 | 29 |
| Hao Hua | PE-032 | 21 | Jing Li | EM-029 | 23 |
| | EM-036 | 23 | Jing Wang | EM-032 | 26 |
| Hao Li | EM-027 | 28 | Jing Wu | EM-047 | 28 |
| Haoliang Jiang | PS-013 | 22 | Jingmao Wen | PS-008 | 32 |
| He Zhang | EM-034 | 26 | Jingwen Zheng | EM-018 | 26 |
| Heng Hu | EM-021 | 28 | | PE-023 | 29 |
| | EM-025 | 28 | Jingze Qian | PS-010 | 22 |
| | EM-022 | 28 | Jinmei Jiang | PE-018 | 29 |
| Hengxu Zhang | PS-013 | 22 | Jinqiao Chen | EM-021 | 28 |
| Hongjun Luo | EA-002 | 32 | | EM-025 | 28 |
| | PS-012 | 32 | | EM-022 | 28 |
| Hongyi Yang | PE-046 | 19 | Jiyan Liu | PS-014 | 22 |
| Hu Wang | EM-020 | 27 | Jun Tong | EM-042 | 27 |
| | PE-022 | 29 | | EM-043 | 27 |
| Huan Yang | EA-007 | 19 | | | |
| | PE-044 | 19 | | | |
| Hui Li | EM-050 | 27 | Kai Sun | EM-011 | 20 |
| | PE-049 | 30 | Kaifeng Liu | EM-017 | 27 |
| Huijun Wang | EM-034 | 26 | | EM-019 | 27 |
| Huixian Zhang | EM-044 | 28 | | PE-021 | 29 |
| | | | Kailun Du | EM-017 | 27 |
| | | | | EM-019 | 27 |
| J. Gong | PE-031 | 21 | Kang Shuai | EM-018 | 26 |
| | PE-030 | 24 | | PE-023 | 29 |
| J. Huang | PE-031 | 21 | Ketut Wirtayasa | EM-052 | 20 |
| Jian Zhang | EM-046 | 19 | Kunlun Zhang | EM-044 | 28 |
| Jianfeng Qu | PE-052 | 31 | | | |
| Jianping Zhang | EM-017 | 27 | | | |
| | EM-019 | 27 | Le Deng | EM-025 | 28 |
| Jianqi Qiu | PE-054 | 19 | Lei He | EM-034 | 26 |
| Jianqiu Xiao | EM-020 | 27 | Lei Li | EM-032 | 26 |
| Jian-Xin Shen | EM-045 | 19 | Li Lei | PE-033 | 30 |
| Jiawei Liu | PS-011 | 32 | | PE-035 | 30 |
| Jie Xu | EM-047 | 28 | Li Xiang | PE-044 | 19 |
| Jin Wang | PE-020 | 21 | Li Zhu | EM-037 | 20 |
| | PE-024 | 24 | | PE-033 | 30 |
| | EM-018 | 26 | | PE-035 | 30 |
| | EM-020 | 27 | Libing Zhou | PE-020 | 21 |
| | PE-022 | 29 | | PE-024 | 24 |

| Author | Paper-ID | Page | Author | Paper-ID | Page |
|---------------|----------|------|--------------|----------|------|
| | EM-020 | 27 | | | |
| | PE-022 | 29 | | | |
| Lihua Zhou | EM-027 | 28 | | | |
| Limei Chen | PE-015 | 24 | | | |
| Lin Yao | PS-004 | 32 | | | |
| Ling Qin | EM-017 | 27 | | | |
| | EM-019 | 27 | | | |
| Lingfeng Cai | EM-046 | 19 | | | |
| Linyun Li | PS-005 | 32 | | | |
| Litao Dai | EA-002 | 32 | | | |
| | PS-012 | 32 | | | |
| Lu Wang | EM-043 | 27 | | | |
| Lu Zhou | PE-037 | 30 | | | |
| Lun Jia | EM-005 | 26 | | | |
| M | | | | | |
| Mengmeng Ai | EM-009 | 27 | | | |
| Mengqiu Li | PE-016 | 30 | | | |
| Min Wu | PS-008 | 32 | | | |
| Ming Jin | EM-047 | 28 | | | |
| Minghao Qiu | EM-011 | 20 | | | |
| Mingkai Cui | PE-010 | 21 | | | |
| Ming-Xing Xu | EM-012 | 20 | | | |
| | EM-013 | 20 | | | |
| Mingyao Lin | EM-005 | 26 | | | |
| | PE-005 | 29 | | | |
| N | | | | | |
| Na Huang | EM-042 | 27 | | | |
| | EM-043 | 27 | | | |
| Niumei Li | EM-042 | 27 | | | |
| N-k. Nguyen | PE-031 | 21 | | | |
| | PE-030 | 24 | | | |
| O | | | | | |
| Omes J. Bajwa | PE-002 | 21 | | | |
| P | | | | | |
| Peilin Liu | PE-028 | 25 | | | |
| | EA-004 | 31 | | | |
| Q | | | | | |
| | | | Qiang Li | EM-032 | 26 |
| | | | Qiang Zhou | PE-016 | 30 |
| | | | | EA-002 | 32 |
| | | | | PS-012 | 32 |
| | | | Qidi Shen | PE-046 | 19 |
| | | | Qingguo Sun | PE-013 | 24 |
| | | | | PE-014 | 24 |
| | | | | PE-015 | 24 |
| | | | Qiwei Xie | PE-054 | 19 |
| R | | | | | |
| | | | Ralph Kennel | PE-039 | 24 |
| | | | Renhua Jiang | EM-028 | 23 |
| | | | Ronghai Qu | EM-016 | 20 |
| | | | | EM-015 | 20 |
| | | | Rui Wang | EM-046 | 19 |
| | | | Ruiwu Cao | EM-027 | 28 |
| S | | | | | |
| | | | Senqing Zhuo | PE-043 | 19 |
| | | | Shan Jiang | EM-021 | 28 |
| | | | | EM-025 | 28 |
| | | | | EM-022 | 28 |
| | | | Shanzhong Ju | PS-009 | 32 |
| | | | Shaowei Rao | PS-004 | 32 |
| | | | Shiwei Yan | EM-030 | 31 |
| | | | Shiyong Yang | PS-004 | 32 |
| | | | Shuai Wang | EM-005 | 26 |
| | | | | PE-005 | 29 |
| | | | Shuang Wang | EM-021 | 28 |
| | | | Shujun Zhang | PE-002 | 21 |
| | | | Shunjie Ni | EM-027 | 28 |
| | | | Shuo Wang | EM-011 | 20 |
| | | | Shushu Zhu | EM-028 | 23 |
| | | | Sifeng Zhao | PE-021 | 29 |
| | | | Siwei Zhang | EM-014 | 23 |
| | | | Sizheng Yu | PS-005 | 32 |

| Author | Paper-ID | Page | Author | Paper-ID | Page |
|---------------|----------|------|---------------|----------|------|
| | T | | | | |
| Taiying Zheng | PS-006 | 22 | Wen-Juan Hao | EM-031 | 23 |
| | PS-010 | 22 | Wenxi Yao | PE-043 | 19 |
| | PS-007 | 22 | Wuhua Li | PE-043 | 19 |
| | PS-008 | 32 | | X | |
| | PS-009 | 32 | Xi Zeng | EA-007 | 19 |
| | PS-011 | 32 | Xiang Luo | EM-039 | 28 |
| Tao Peng | EM-021 | 28 | | PE-033 | 30 |
| | EM-025 | 28 | | PE-034 | 30 |
| | EM-022 | 28 | Xiang-ao Liu | EM-012 | 20 |
| Tao Pu | EM-042 | 27 | Xiaofeng Ding | PE-004 | 21 |
| Tao Zhou | EM-037 | 20 | Xiaoyan Huang | EM-046 | 19 |
| Tianguang Lv | PS-014 | 22 | | PE-046 | 19 |
| Tianze Lan | PE-013 | 24 | Xiaoyu Fang | PE-052 | 31 |
| Tingna Shi | PE-037 | 30 | Xie Wu | PE-006 | 29 |
| Tong Zhou | PE-049 | 30 | Xin Zhao | PS-014 | 22 |
| | | | Xingchao Jiao | PS-011 | 32 |
| | W | | | PS-007 | 22 |
| W. Tian | PE-031 | 21 | | PS-008 | 32 |
| | PE-030 | 24 | Xinmin Li | PE-037 | 30 |
| Wanlei Xue | PS-014 | 22 | Xiuhe Wang | EM-034 | 26 |
| Wei Chen | PS-006 | 22 | Xuan Li | EM-015 | 20 |
| | PS-010 | 22 | Xueqian Huang | EM-047 | 28 |
| | PS-007 | 22 | Xuewei Xiang | EM-050 | 27 |
| | PE-037 | 30 | | PE-049 | 30 |
| | PS-008 | 32 | Xuezhong Zhu | PE-028 | 25 |
| | PS-009 | 32 | Xuxuan Zhang | PE-039 | 24 |
| | PS-011 | 32 | Xuzhen Huang | EM-029 | 23 |
| Wei Le | EM-005 | 26 | | Y | |
| Wei Xu | EM-042 | 27 | Y. Huang | PE-030 | 24 |
| | EM-043 | 27 | Y. Zhu | PE-031 | 21 |
| Weiwei Geng | EM-032 | 26 | | PE-030 | 24 |
| Weiyan Zheng | EM-047 | 28 | Yameng Chai | PE-004 | 21 |
| Wen Zhang | EM-012 | 20 | Yanfang Hu | PE-011 | 31 |
| | EM-013 | 20 | | PE-012 | 31 |
| Wenhao Zhang | EM-011 | 20 | Yang Liu | PS-004 | 32 |
| Wenhui Liu | EM-009 | 27 | Yang Zhao | EM-019 | 27 |
| Wenjie Ju | PS-014 | 22 | | PE-021 | 29 |
| Wen-jie Zheng | EM-012 | 20 | | | |

| Author | Paper-ID | Page | Author | Paper-ID | Page |
|---------------|----------|------|---------------|----------|------|
| Yanjun Yu | PE-010 | 21 | Zhang Chen | EM-020 | 27 |
| Yaodong Wang | EM-009 | 27 | Zhe Chen | PE-039 | 24 |
| Yaohua Hu | EM-028 | 23 | Zheng Fan | PS-006 | 22 |
| Yawei Wang | EM-016 | 20 | Zhenning Qi | EM-034 | 26 |
| | EM-015 | 20 | Zhibo Chen | EM-039 | 28 |
| Yi Zhang | EM-031 | 23 | | PE-034 | 30 |
| | PE-052 | 31 | Zhihao Song | PE-043 | 19 |
| Yilin Ma | EA-007 | 19 | Zhijian Hu | EM-020 | 27 |
| Yixiao Li | PS-014 | 22 | Zhiquan Deng | PE-026 | 29 |
| Yong Li | EM-013 | 20 | Zhiyong Kang | PE-011 | 31 |
| Yongming Xu | EM-009 | 27 | | PE-012 | 31 |
| Yongzihao Dai | PE-021 | 29 | Zhu Zhang | PE-018 | 29 |
| Youtong Fang | EM-046 | 19 | Zhuoran Zhang | EM-032 | 26 |
| Yu Du | PS-004 | 32 | Zibo Li | PE-020 | 21 |
| Yu Wang | EM-031 | 23 | Zicheng Zhou | PE-032 | 21 |
| Yu Xiang | EM-017 | 27 | | EM-036 | 23 |
| Yuanwen Li | EA-006 | 32 | Ziyi Xu | EM-009 | 27 |
| Yue Zhang | EM-034 | 26 | | | |
| Yuhang Cheng | EM-016 | 20 | | | |
| Yujie Qian | PE-028 | 25 | | | |
| | EA-004 | 31 | | | |
| | EM-030 | 31 | | | |
| Yujun Guo | EM-035 | 26 | | | |
| Yuling He | EM-011 | 20 | | | |
| Yu-Ling He | EM-012 | 20 | | | |
| | EM-013 | 20 | | | |
| Yulong Liu | PE-019 | 21 | | | |
| | EM-014 | 23 | | | |
| Yunkai Huang | PE-006 | 29 | | | |
| Yutai Mao | PE-028 | 25 | | | |
| Yuwei Zhu | PE-028 | 25 | | | |
| | EA-004 | 31 | | | |
| Z | | | | | |
| Zaixun Ling | EM-018 | 26 | | | |
| | PE-023 | 29 | | | |
| Zewen Huang | PE-019 | 21 | | | |
| | EM-014 | 23 | | | |
| Ze-Zheng Wu | EM-045 | 19 | | | |
| Zezhong Chen | EM-028 | 23 | | | |