

National Rail Transit Electrification and Automation Engineering Technology Research Centre (Hong Kong Branch)

國家軌道交通電氣化與自動化工程技術研究中心香港分中心

2023 ANNUAL REPORT (ENGLISH VERSION)



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Director's Foreword



Year 2023, the beginning of the post-pandemic era, marked the first anniversary of the reopening of the Shenzhen Futian to Hong Kong West Kowloon section of the Guangzhou-Shenzhen-Hong Kong High-Speed Rail. According to statistics, the total number of local railway passengers in Hong Kong in 2023 has recovered to over 90% of pre-pandemic levels, while the operation of cross-border high-speed rail is gradually transforming towards a “public transportation” mode.

Looking back at the past year, the Hong Kong Branch of the National Rail Transit Electrification and Automation Engineering Technology Research Centre (hereinafter referred to as “CNERC-Rail (HK Branch)”) has achieved fruitful results through the dedicated efforts of all staff members. We continued to promote technological innovation, advancement in railway safety, operation and intelligent maintenance, thereby driving industrial upgrading in the field of rail transportation.

In 2023, CNERC-Rail (HK Branch) actively established collaboration with various universities, research institutions, and enterprises. Such collaboration included signing a research cooperation agreement with Zhejiang Communications Investment Group Co. Ltd., and a memorandum of cooperation with its subsidiary, the Intelligent Transportation Research Company, to establish a partnership. We also signed a research cooperation agreement with Zhejiang Provincial Rail Transit Operation and Management Group Co., Ltd., adopting a new model of integrated collaboration among academia, industry, and research institutions to facilitate the sharing of talent, technology, and information resources. Additionally, we signed a research project cooperation agreement with Wuyi University and CRRC Guangdong Co., Ltd. in the field of “intelligent robots and high-end equipment manufacturing,” focusing on key technologies for developing the intelligent lifecycle of intercity rolling stock driven by the Industrial Internet of Things. Furthermore, we signed a cooperation agreement with the Shenzhen Academy of Disaster Prevention and Reduction to establish a joint Laboratory, aiming at promoting scientific research and advanced technology development in the field of disaster prevention and mitigation. To address subway line noise issues, we established a joint noise laboratory with the Hong Kong MTR Corporation at Tai Wai Depot, focusing on the development of vibration and noise control products. To promote academic exchange among universities, faculties, and students across the Taiwan Strait and the Hong Kong-Macao region,

CNERC-Rail (HK Branch), in collaboration with the Chinese Society for Vibration Engineering, co-hosted the 11th CSW-MCCE 2023.

In the past year, our talented staff at CNERC-Rail (HK Branch) demonstrated resilience and team spirit in conducting advanced research work with support from the Ministry of Science and Technology of the People's Republic of China, the Innovation and Technology Department of the Hong Kong SAR Government and the Hong Kong Polytechnic University. Looking ahead, we will enhance research capability, promote technological applications, and elevate railway engineering standards. We aim to strengthen CNERC-Rail (HK Branch) and to prioritize talent development, making contributions to the sustainable growth of the national railway industry.

Yi-Qing Ni

Chair Professor

Yim, Mak, Kwok & Chung Endowed Professorship in Smart Structures

Director of

National Rail Transit Electrification and Automation Engineering Technology

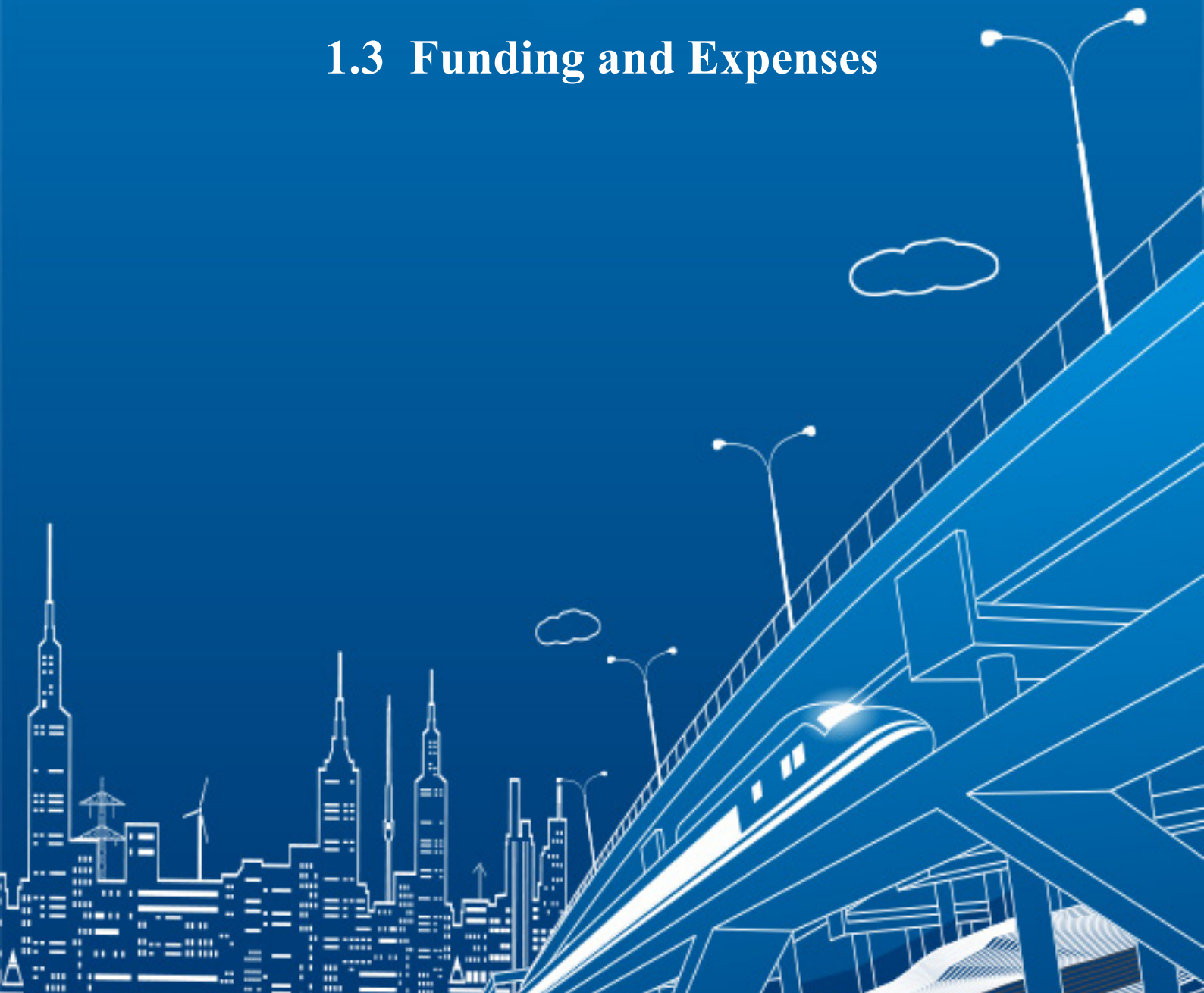
Research Centre (Hong Kong Branch)

1. Overview of CNERC-Rail (HK Branch) in 2023

1.1 Introduction

1.2 Research Teams

1.3 Funding and Expenses



1. Overview of CNERC-Rail (HK Branch) in 2023

1.1 Introduction

The National Rail Transit Electrification and Automation Engineering Technology Research Centre Hong Kong Branch, CNERC-Rail (HK Branch), was established in 2015 upon approval by the Ministry of Science and Technology of the People's Republic of China. It affiliates to the Hong Kong Polytechnic University (PolyU) and operates under the management of the university. It receives financial support regarding research and daily operations from the Innovation and Technology Commission (ITC) of the Hong Kong SAR Government and the PolyU. CNERC-Rail (HK Branch) has built up an interdisciplinary research team taking advantage of research resources in advanced sensing, smart materials, and data-driven analyzing techniques available in the university.



Mission: To develop state-of-the-art monitoring technologies embracing smart materials and advanced big data analysis methods for the rail transit system.

Vision: To accelerate the process of constructing intelligent rail transit including high-speed rail, metro, and maglev systems concerning safety and reliability, promoting innovative monitoring technologies for rail transit from Hong Kong to Asia and worldwide.

CNERC-Rail (HK Branch) has achieved fruitful outcomes in terms of academic research, and engineering application in 2023 through undertaking scientific research projects, performing engineering and consultancy services, and strengthening partnership with other research institutes and enterprises.

Major items of work of CNERC-Rail (HK Branch) in 2023 are presented in detail in the following sections.

1.2 Research Teams

CNERC-Rail (HK Branch) consists of 13 key members (Table 1.1) and four collaborative members (Table 1.2) from different departments who lead R&D projects. To strength its research capability and to enable efficient execution of research tasks, CNERC-Rail (HK Branch) also actively recruits research talents from worldwide (Table 1.3) to participate in R&D projects.

Table 1.1 Key members of CNERC-Rail (HK Branch)

No.	Name and Position	Department	Remark
1	Yi-Qing Ni, Chair Professor	Department of Civil and Environmental Engineering	Director
2	Kang-Kuen Lee, Professor	Department of Electrical Engineering	Deputy Director
3	Hwa-Yaw Tam, Chair Professor	Department of Electrical Engineering	Project Leader
4	Li Cheng, Chair Professor	Department of Mechanical Engineering	Project Leader
5	Jian-Nong Cao, Chair Professor	Department of Computing	Project Leader
6	Xiao-Li Ding, Chair Professor	Department of Land Surveying and Geo-informatics	Project Leader
7	Ka-Wai Cheng, Professor	Department of Electrical Engineering	Project Leader
8	Siu-Wing Or, Professor	Department of Electrical Engineering	Project Leader
9	Zhong-Qing Su, Professor	Department of Mechanical Engineering	Project Leader
10	Dan Wang, Professor	Department of Computing	Project Leader
11	Song-Ye Zhu, Professor	Department of Civil and Environmental Engineering	Secretary
12	Siu-Kai Lai, Associate Professor	Department of Civil and Environmental Engineering	Project Leader
13	You Dong, Associate Professor	Department of Civil and Environmental Engineering	Project Leader

Table 1.2 Collaborative members of CNERC-Rail (HK Branch)

No.	Name and Position	Department	Remark
1	Qi Zhao, Assistant Professor	Department of Civil and Environmental Engineering	Project Leader
2	Fang-Xin Zou, Assistant Professor	Department of Aeronautical and Aviation Engineering	Project Leader
3	Si-Wei Liu, Assistant Professor	Department of Civil and Environmental Engineering	Project Leader

Table 1.3 Recruited staff of CNERC-Rail (HK Branch)

No.	Name	Position	Period of Employment	
1	You-Wu Wang	Research Assistant Professor	2021-01-04	2024-06-30
2	Su-Mei Wang	Research Assistant Professor	2021-09-01	2024-06-30
3	Wai-Kei Ao	Research Assistant Professor	2022-08-29	2025-06-30
4	Zheng-Wei Chen	Research Assistant Professor	2022-08-29	2025-06-30
5	Hong-Wei Li	Research Assistant Professor	2023-07-01	2025-06-30
6	Tai-Tung Wai	Research Technical Assistant	2017-01-23	2027-01-22
7	Wing-Hong Kwan	Research Technical Assistant	2017-10-04	2024-03-31
8	Tung-Mui Lui	Executive Officer	2023-06-19	2024-01-02
9	Wen-Qiang LIU	Postdoctoral Fellow, Research Fellow	2021-10-05	2024-10-04
10	Yang Zhang	Postdoctoral Fellow	2022-11-01	2024-10-31
11	Mujib Olamide ADEAGBO	Postdoctoral Fellow	2023-05-15	2025-05-14
12	Duo Zhang	Postdoctoral Fellow	2022-05-16	2024-05-15
13	Zi-Yu Tao	Postdoctoral Fellow	2022-07-18	2024-07-17
14	Yuan-Peng He	Postdoctoral Fellow	2023-02-06	2024-05-03

15	Wei Liu	Postdoctoral Fellow	2023-02-28	2025-02-27
16	E Deng	Postdoctoral Fellow	2022-06-13	2024-02-13
17	Wen-Bo Hu	Postdoctoral Fellow	2023-08-28	2025-07-31
18	Zi-Jian Guo	Postdoctoral Fellow	2023-11-13	2025-11-12
19	Chang-Chang Wang	Postdoctoral Fellow	2022-08-10	2024-08-09
20	Wei Jiang	Postdoctoral Fellow	2022-12-02	2024-12-01
21	Omid HAJIZAD	Postdoctoral Fellow	2023-03-01	2025-02-28
22	Ru-Yang Yin	Postdoctoral Fellow	2023-09-28	2025-09-28
23	Si-Yi Chen	Research Assistant, Research Associate	2023-03-01	2024-08-31
24	Xin Ye	Research Assistant, Research Associate	2023-01-03	2024-03-31
25	Yuan-Hao Wei	Research Assistant, Research Associate	2023-01-03	2024-07-28
26	Qi-Fan Zhou	Research Assistant	2021-03-08	2024-08-20
27	Jian Zhou	Research Assistant	2023-03-30	2024-09-29
28	Jia-Hao Lu	Research Assistant	2023-05-12	2023-05-12
29	Yang Lu	Research Assistant	2023-04-01	2024-03-31
30	Ying-Nan Hu	Research Assistant	2023-07-03	2024-12-31
31	Yu-Ling Wang	Research Assistant	2021-04-14	2024-04-15
32	Yu-Xuan Liang	Research Assistant	2022-11-07	2024-05-06
33	Qing-Chen Tang	Research Assistant	2023-08-31	2024-01-30
34	Guang-Zhi Zeng	Research Assistant	2022-10-28	2024-10-27
35	Zhan-Hao Guo	Research Assistant	2023-03-01	2024-02-29

36	Huan Yue	Research Assistant	2023-07-13	2025-01-10
37	Xin-Yuan Liu	Research Assistant	2023-07-13	2025-01-10
38	Kang Cai	Research Assistant	2023-10-26	2024-04-26
39	Lei Yuan	Research Assistant	2024-01-02	2024-06-30
40	Sheng-Yuan Liu	Research Assistant	2022-05-25	2023-11-24
41	Zheng-Xin Che	Research Assistant	2022-09-01	2023-11-27
42	Han-Zhang Lu	Research Assistant	2022-11-01	2024-05-31
43	Xiang-Xiong LI	Research Assistant	2021-07-15	2023-12-31
44	Guang Zhou	Technician	2018-04-01	2023-10-31
45	Ho Wai Lun	Principal Research Fellow (PT)	2023-11-01	2024-04-30
46	Wong Kai Yuen	Principal Research Fellow (PT)	2023-11-27	2024-11-26
47	Cheung Shuk Ching	Senior Research Fellow (PT)	2023-11-01	2024-04-30
48	Chi-Ming Tang	Research Fellow (PT)	2022-08-01	2024-07-31
49	Cheung Tsz Kin	Research Associate (PT)	2023-11-01	2024-04-30
50	Chi-Shing Liu	Research Assistant (PT)	2023-03-01	2024-02-29

1.3 Funding and Expenses

General breakdown for 2023:

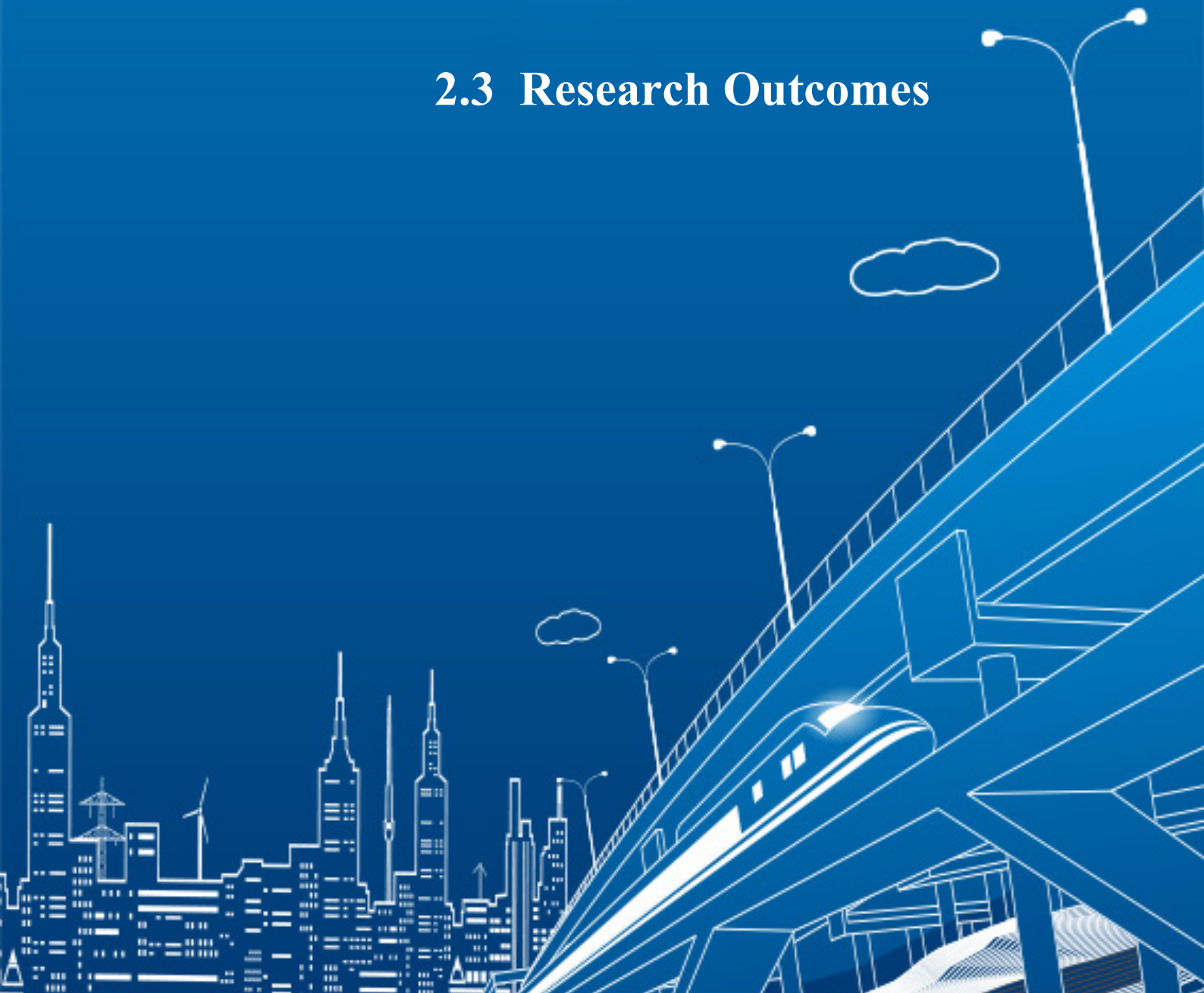
1. Income: 22,000,000 HK Dollars	
ITC Funding	HKD 20,000,000.00
PolyU Funding	HKD 2,000,000.00
2. Expenses: 22,000,000 HK Dollars	
Research Projects	HKD 4,852,824.98
Human Resource	HKD 8,855,074.50
Equipment Purchase	HKD 7,007,748.62
General Expenses	HKD 1,284,351.90

2. R&D Activities

2.1 Research Projects

2.2 Research Progress

2.3 Research Outcomes



2. R&D Activities

2.1 Research Projects

2.1.1 Research Grants Applications

In 2023, CNERC-Rail (HK Branch) has applied for, by itself or jointly with partners, 20 research grants in Hong Kong and the mainland, among which 13 have been approved providing total funding of around 66.0 million HKD. The remaining 7 applications are still being processed. The funding schemes include a theme-based research scheme under the Research Grants Council (RGC) of the Hong Kong SAR Government, and the Large Equipment Fund of the Hong Kong Polytechnic University. A list of concerned projects is given in Table 2.1.

Table 2.1 Projects seeking research grants in 2023

No.	Title	Funding Source	Amount	Status
1	Intact: Intelligent tropical-storm-resilient system for coastal cities	Hong Kong Research Grants Council, Theme-based Research Scheme	HKD 48,293,000	Approved
2	Digital twin-enabled intelligent assessment and maintenance of offshore wind turbine structures in a life-cycle context	Hong Kong Research Grants Council, Research Impact Fund	HKD 4,970,000	Approved
3	Smart refrigeration truck development programme -power, solar and intelligence method for logistics and storage	Innovation and Technology Support Programme (2023)	HKD 4,933,500	Approved
4	A ground-breaking platform for fully noncontact, nano-scale characterization of micro-electronic systems and materials using ultrafast laser and optical technology	The Hong Kong Polytechnic University (Large Equipment Fund)	HKD 3,431,744	Approved
5	Develop next-generation typhoon-resistant deep-sea offshore floating hybrid wind-wave energy converters: from coupling load mechanism to vibration mitigation technology	National Natural Science Foundation of China (NSFC) / Research Grants Council (RGC), Collaborative Research Scheme(CRS)	HKD 3,350,000	Approved
6	Development of a new inerter-based rail damper to mitigate railway-induced ground-	MTR Research Funding Scheme (2023)	HKD 1,270,000	Approved

	borne noise by a physics-informed deep learning framework			
7	A skin-mimetic, wearable acoustic “interface” for trapping, relaying, and boosting ultrasonic leaky waves in attenuative human tissues	Hong Kong Research Grants Council, General Research Fund	HKD 1,132,534	Approved
8	Synergistic solutions for the crosswind effect on high-speed trains using active blowing/suction and passive windproof facility: simulation, experiment and data-driven modelling	Hong Kong Research Grants Council, General Research Fund	HKD 1,130,000	Approved
9	Self-centering seismic-resistant eccentrically braced frames with superelastic shape memory alloy angles	Hong Kong Research Grants Council, General Research Fund	HKD 1,130,000	Approved
10	Application of underwater robot for inspection and health monitoring of submerged parts of bridges	Department of Aeronautical and Aviation Engineering, The Hong Kong Polytechnic University	HKD 500,000	Approved
11	Investigation on vibration control and system optimization of maglev train-track-bridge interaction	National Natural Science Foundation of China	CNY 300,000	Approved
12	Coupling mechanism of train-wind-rain and prevention and control strategies of traffic safety for high-speed railway tunnel-subgrade transition sections	National Natural Science Foundation of China	CNY 300,000	Approved
13	Outsourcing test of deformation and stress state of the leveling valve connecting components of Guangzhou metro line 14	CRRC Zhuzhou Locomotive Co., Ltd.	CNY 120,000	Approved
14	All-round solution to mitigate railway noise in development of smart rail system	Innovation and Technology Commission (ITC), HKSAR	HKD 180,000,000	Pending
15	Research on the basic theory and key technologies of smart wheels for intelligent vibration and noise reduction in rail transit	Construction and Development Affairs Office of Shenzhen-Hong Kong Science and Technology Innovation Cooperation Zone in Loop, Futian District, Shenzhen	CNY 70,000,000	Pending

16	An electromagnetic-driving-based two-way moving model testing system for high-speed railway	The Hong Kong Polytechnic University (Large Equipment Fund)	HKD 3,950,000	Pending
17	Optical meteorologic observation system based on scanning doppler LiDAR for full-scale visualization of high-speed rail transit aerodynamics	The Hong Kong Polytechnic University (Large Equipment Fund)	HKD 3,210,000	Pending
18	Optimization and regulation of lithium-sulfide cathodes for lithium-ion sulfur batteries of high energy density and high safety	2024 Shenzhen-Hong Kong-Macau Science and Technology Program (Category C)	CNY 3,000,000	Pending
19	Wearable portable fNIRS system for comprehensive evaluation of vibration, noise, and pressure comfort for high-speed trains	The Hong Kong Polytechnic University (Large Equipment Fund)	HKD 2,800,000	Pending
20	Research on explicit optimal control for levitation stability of maglev trains considering random guideway irregularity	National Natural Science Foundation of China (NSFC) / Research Grants Council (RGC) Joint Research Scheme (JRS)	HKD 968,000	Pending

2.1.2 Research Projects Undertaken

In 2023, CNERC-Rail (HK Branch) carried out a total of 13 research projects, as listed in Table 2.2.

Table 2.2 Carried out research projects in 2023

No.	Title	Principal Investigator	Department	Start-End Data
1	High-performance vehicle suspension consisting of paralleled inerter and semiactive electromagnetic damper with dual functions of vibration control and energy harvesting	Prof. Song-Ye Zhu	Department of Civil and Environmental Engineering	2022-05-01 ~ 2023-07-31
2	Quantitative Assessment of the Acoustic Emissions from Rail Track Cracking	Assistant Prof. Qi Zhao	Department of Civil and Environmental Engineering	2022-05-01 ~ 2023-10-31

3	Meta-material assisted structural health monitoring for both thin and thick wall structures	Prof. Li Cheng	Department of Mechanical Engineering	2022-05-01 ~ 2024-01-31
4	Industrial IoT Fibre Sensor Technology for Maglev Bogie Monitoring	Prof. Kang-Kuen Lee Prof. Hwa-Yaw Tam	Department of Electrical Engineering	2022-06-01 ~ 2023-11-31
5	Smart Technologies for Emerging Sensing, Absorption, Utilization, and Management of Energies in Electrified Transportation Infrastructures and Systems	Prof. Siu-Wing Or	Department of Electrical Engineering	2022-06-01 ~ 2023-12-31
6	Digital-twin-enabled artificial intelligent damage detection and localization for train axle structures based on quasi-surface waves	Prof. Li Cheng	Department of Mechanical Engineering	2022-07-01 ~ 2023-04-30
7	Diffuse ultrasonic wave-based structural health monitoring for high-speed rail track	Prof. Zhong-Qing Su	Department of Mechanical Engineering	2022-07-01 ~ 2023-12-31
8	Energy Storage and Charging Techniques for Partial Catenary-free Railway System	Prof. Ka-Wai Cheng	Department of Electrical Engineering	2022-07-01 ~ 2024-03-31
9	Predictive asset maintenance through intelligent algorithms	Associate Prof. You Dong	Department of Civil and Environmental Engineering	2022-09-01 ~ 2024-02-29
10	Next-generation Structural Analysis of Individual Members through Physics-Informed Neural Networks (PINNs)	Assistant Prof. Si-Wei Liu	Department of Civil and Environmental Engineering	2022-09-13 ~ 2023-09-12
11	Thermal analysis of laminated window glass panels of high-speed trains under extreme conditions by using an advanced matched interface and boundary method	Associate Prof. Siu-Kai Lai	Department of Civil and Environmental Engineering	2022-10-01 ~ 2024-03-31
12	Edge-Cloud collaborative real-time railway monitoring platform	Prof. Jian-Nong Cao	Department of Computing	2022-11-01 ~ 2024-04-30
13	A Metaverse System for the Design and Inspection of Railway Structures	Prof. Dan Wang	Department of Computing	2022-11-01 ~ 2024-04-30

2.2 Research Progress

2.2.1 Development of track damper to suppress rail wave abrasion and noise

Under specifications of the Innovation and Technology Fund (ITF) outlined specifications, vibration dampers need to be developed using particle damping technology. The main objective of this work is to design an innovative modular rail damper that utilises particle damping technology to suppress the formation of rail wave abrasion and to mitigate railway noise in the 100 to 2000 Hz spectrum. This study combines the modular design approach with particle damping technology to design an innovative Modular Rail Particle Damper (MRPD). This design concept is adopted to fine-tune rail dampers by considering the inherent dynamic characteristics of the rail in its actual position, and to control the vibration and rolling noise of the rail for specific frequencies. To achieve this end, a numerical model is developed to accurately simulate the nonlinear behaviour of the particle damper and to optimise the design parameters of the MRPD according to the structural characteristics of the rail. Subsequently, the particle damper is modelled using a discrete element method and combined with a finite element model (FEM) of the track to validate the efficacy of the designed MRPD for vibration control. In addition, a comprehensive dynamic test was conducted to evaluate the performance of the developed MRPD under broadband dynamic excitation as shown in Fig. 2.1. The development of MRPD is of great importance in addressing noise pollution and rail wave abrasion in railway systems. Successful application of this technology is expected to bring many advantages, including reduced maintenance costs, longer railway service life and other benefits to the local and global railway industry.



Fig. 2.1 Field test and experimental setups

(1) Field Research in MTR Tuen Ma Line between Ma On Shan and Wu Kai Sha Stations

The section of Tuen Ma Line between Ma On Shan Station and Wu Kai Sha Station was opened in 2004. This section of the line recently experienced excessive noise during operation and has received complaints from nearby residents. The excessive noise problem not only affects the life of the residents and the comfort of passengers inside the train, but also indicate possible abnormal vibration and rail wave during train operation. This would increase wear and tear of the track system, and the cost of operation and maintenance. On September 10, 2023, Prof. Xue-Song Jin from Southwest Jiaotong University and members of CNERC-Rail (HK Branch) Dr. Siu-Kai Lai, Dr. Kai Zhou, Dr. Wai-Kei Ao, Dr. Duo Zhang, Dr. Yuan-Peng He, Mr. Xin Ye, Mr. Yang Lu, Mr. Yu-Xuan Liang, Mr. Qing-Chen Tang carried out on-site investigations in the area where noise was found to be excessive (Fig. 2.2 and Fig. 2.3). On-site research found that the track condition in this section is characterised by the following findings: the overall condition of the rails is good, part of the curves at the side of the grinding situation. The overall condition of the track sound insulation panels is poor with some loosening problems, the actual function cannot be guaranteed and may cause secondary noise. Further testing is necessary to identify the main noise sources.



Fig. 2.2 On-site investigation of track sections with excessive noise



Fig. 2.3 Signs of orbital side grinding and debris

(2) MTR Diamond Hill Station Field Test

In June 2020, the section of MTR Tuen Ma Line connecting Diamond Hill Station and Kai Tak Station commenced operation. After a period of operation, it was found that the rails in this section showed abnormal wave abrasion phenomenon i.e. regular fluctuating deformation of the rail surface. Such abnormal abrasion caused significant vibration and noise during train operation, resulting in discomfort to passengers. This situation has aroused the concern of the MTR company. Wave abrasion of rails would accelerate the destruction of rail system components, leading to higher operating and maintenance costs. More importantly, if left unattended, rail abrasion would pose a threat to train safety.



Fig. 2.4 On-site investigation and testing

Recognising the urgency of addressing the problem, the MTR company embarked on a collaborative research project with the CNERC-Rail (HK Branch). The objective of the project is to investigate the root cause of the abnormal corrugation on the rails and to identify measures to prevent and mitigate the problem. From June 1-5, 2023, members of CNERC-Rail (HK Branch) Dr. Wai-Kei Ao, Dr. Zheng-Wei Chen, Dr. E Deng, Dr. Wen-Qiang Liu, Mr. Yu-Ling Wang, Mr. Xin Ye, Mr. Da-Zhi Dang, Mr. Bo-Yang Su, Mr. Zheng-Xin Che, Mr. Zhan-Hao Guo, Mr. Ming-Rui Yan and Mr. Hong-Yin Wang went to the Diamond Hill Station to conduct on-site investigation and tests as shown in Fig. 2.4. The investigation involved a detailed examination of the corrugated rail section and analysis of the potential factors contributing to the corrugation, such as operating conditions, rail material properties and environmental

factors. Depending on the findings, cutting-edge technologies will be applied to tackle the problem.

(3) Installation, Testing and Maintenance of Rail Particle Dampers

The CNERC-Rail (HK Branch) has developed a new type of rail damper based on particle damping technology that can be used for vibration and noise control in rail and is conducting trials at MTR railway facilities. A track section of about 20m long in MTR Kowloon Bay Depot will be fitted with the dampers and the noise reduction effect will be assessed.

On November 15, 2023, members of CNERC-Rail (HK Branch) Dr. Wai-Kei Ao, Dr. Duo Zhang, Mr. Xin Ye, Mr. Yu-Xuan Liang, and Mr. Qing-Chen Tang went to the Kowloon Bay Depot to install and test the track dampers, as shown in Fig. 2.5. 64 sets (128) of track damper were installed for the full installation configuration and 32 sets (64) for the half installation configuration. The dampers consist of fixed modules designed for simplifying and speeding up the manufacturing process. The MRPD is a chamber consisting of cavities of different sizes in which several types of particles can be placed. Due to the curved shape of the rail web, a damper fixing was designed, and a specific clamping mechanism was used to ensure that the MRPD could be securely and safely attached to the rail system. The fixture plays a vital role in ensuring that vibrations are effectively transferred from the rail system to the dampers for effective reduction vibration and noise.



Fig. 2.5 On-site test

(4) Tai Wai Joint Laboratory

To tackle to the problem of noise pollution on MTR lines, MTR CL, and the CNERC-Rail set up a joint noise laboratory in the Tai Wai depot for the development of vibration and noise control products (Fig. 2.6). Performance test of sound-absorbing panels have been carried out in the laboratory, on sound insulation and sound absorption. In the future, a series of studies

will be conducted in this joint lab to explore the feasibility of using meta-structures and metamaterials for designing rail products.

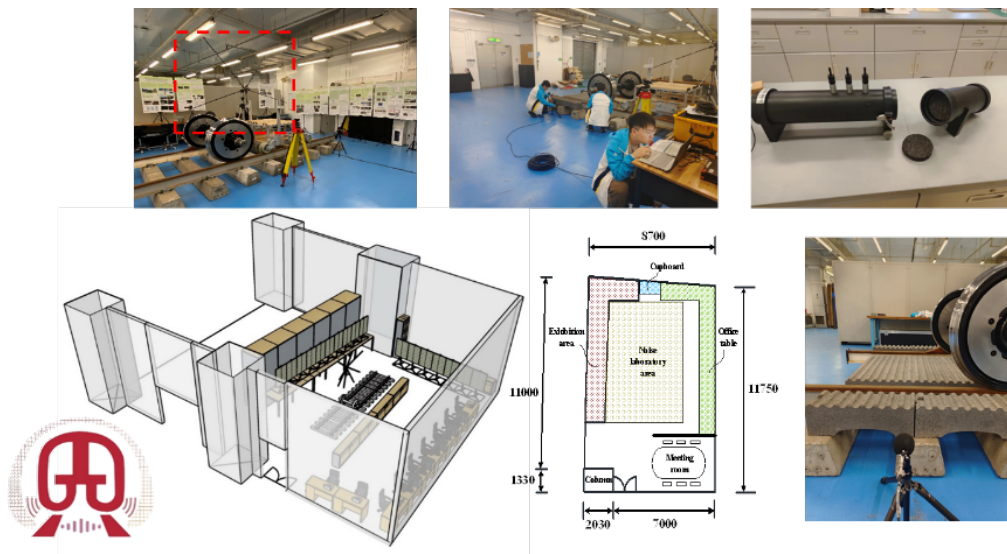
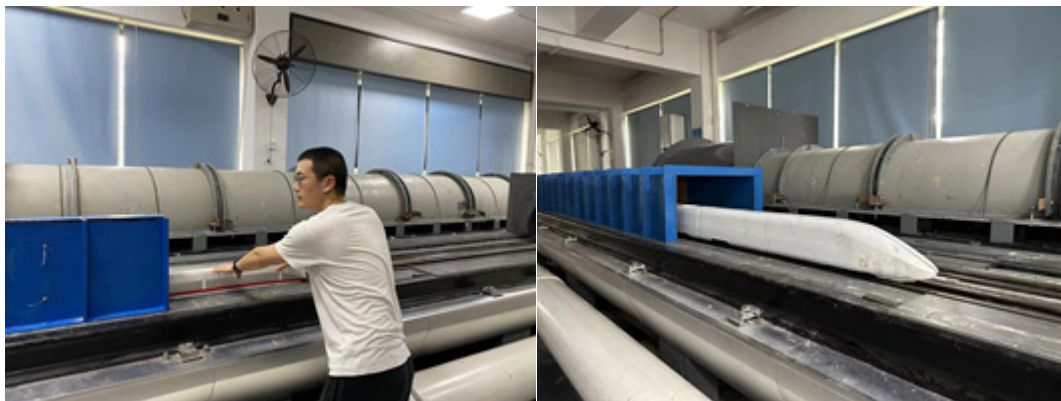


Fig. 2.6 Tai Wai Joint Noise Laboratory

2.2.2 Aerodynamic effect test of high-speed train–noise barrier at Central South University

To address the issues of rail transit safety and structural fatigue damage caused by the aerodynamic effect of high-speed train–noise barrier system, Dr. E. Deng led some team members to the dynamic modeling laboratory of Central South University on July 10, 2023, and built a high-speed train–noise barrier model. A series of aerodynamic pressure tests on noise barriers were conducted to analyze the influence of factors such as train speed, noise barrier form, and buffer facilities on the aerodynamic effect of high-speed train–noise barrier systems.



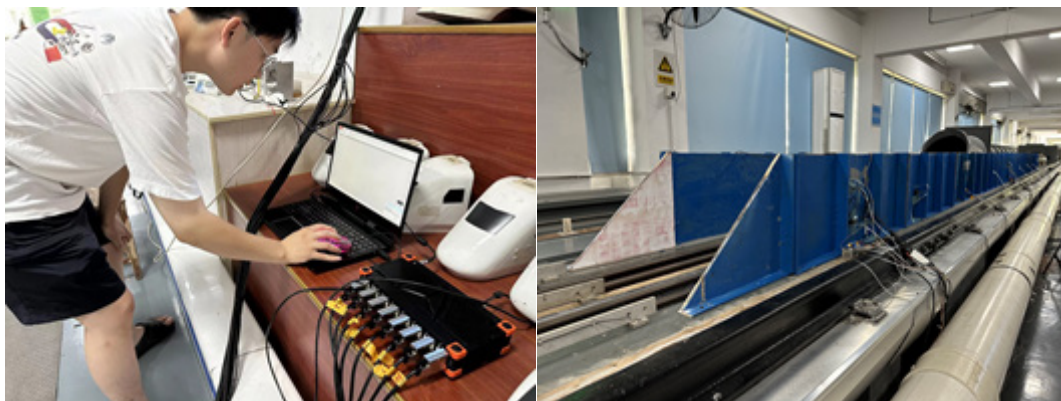


Fig. 2.7 Aerodynamic effect test of high-speed train-sound barrier at Central South University

2.2.3 Moving model tests of comprehensive noise of subway trains with noise barrier protection

As a backbone of urban public transportation, the subway system plays a critical role in alleviating city traffic congestion, expanding urban development boundaries, and enhancing urban environmental quality with its characteristics of high efficiency, high density, low energy consumption, and all-weather operations. However, urban rail transit systems also bring significant noise problems that not only decrease the comfort of passengers inside the trains but may also negatively affect the quality of life for residents along the rail lines. Consequently, noise control in urban rail transit has become a crucial issue for urban environmental protection that requires focused attention.

To identify and address noise issues occurred in urban rail transit, team members including, Dr. Zheng-Wei Chen, Dr. Zi-Jian Guo, Dr. Wen-Bo Hu, and Mr. Yu-Ling Wang, visited the Central South University Dynamic Modeling Laboratory on November 30, 2023, to conduct a series of innovative dynamic model experiments on noise barriers. Utilizing advanced noise measurement techniques, In these experiments, the actual conditions of train entering or exiting a tunnel were simulated for measuring/comparing the effectiveness of different types of noise barriers in reducing noise generated from train operation, with high accuracy in recording noise levels, the team was able to identify an optimal design scheme for noise barrier for effective reduction in tunnel noise for future engineering applications, to enhance passenger comfort, and to improve the quality of life of residents living near rail lines.

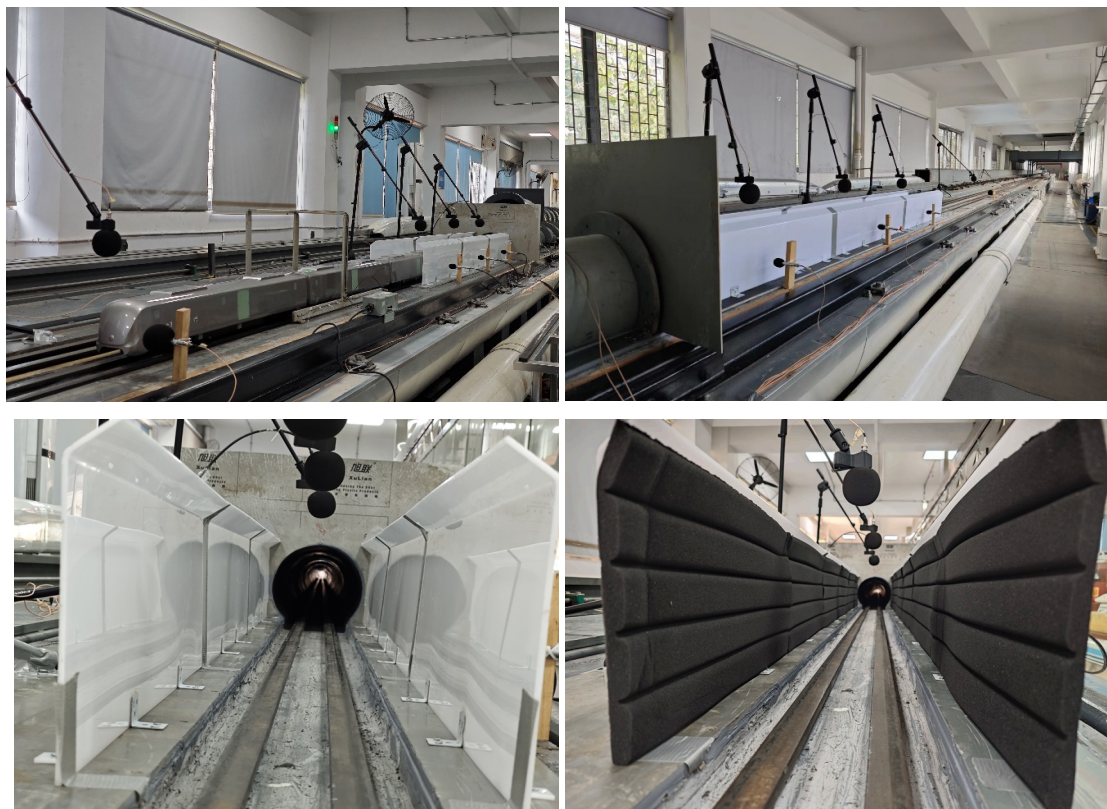


Fig. 2.8 Moving model tests performed at Central South University

2.2.4 Passage of High-speed train through tunnel: assessment of human comprehensive comfort levels

The assessment is conducted on 857-km-long high-speed railway line with a design train speed of 250 kilometres per hour (km/h), with infrastructure reserved for speed increasing to 300 km/h. Under an upgrading project, the main line is 757.37 km long with 225 two-lane tunnels of a total length of approximately 460 km. The design bore area of each tunnel is 92 square metres, which is smaller than 100 square metres specified in the High-speed Railway Design Code for a design train speed of 300 km/h. Due to lining position defects, the bore area of some tunnels is further reduced. The project requires comprehensive assessment of tunnel aerodynamic effects, in-vehicle air pressure comfort, body and equipment compartment aerodynamic loads, in-vehicle noise distribution and other parameters through real-vehicle running tests to ensure that safety and passenger comfort standards are met.

The scope of this study is to collect out data related to comfort of human on train running along a high-speed railway line. The three main purposes of the study are as follows: to explore the environmental impact of high-speed trains in three working conditions, namely through tunnel conditions, train meeting conditions and sonic boom phenomenon generated by internal

and external air pressure changes, noise generation and bumps and other phenomena; to explore the effect of environmental impacts on passenger's comfort under the three working conditions; to analyse the effect of environmental changes on passenger's comfort, through the use of near-infrared brain imaging technology, supplemented by internal and external air pressure, noise, passenger acceleration and other indicators.

Team members including, Dr. Zheng-Wei Chen, Dr. Wai-Kei Ao, Dr. Wen-Bo Hu, Dr. Zi-Jian Guo, Mr Jia-Hao Lu, and Yu-Ling Wang, successfully completed the field tests in September 2023. Comprehensive, key data were collected as a high-speed train ran through tunnels at three different speed, namely, 250 km/h, 280 km/h and 300 km/h. Specifically, a number of indicators such as internal and external air pressure, vehicle speed, interior noise, and passenger acceleration were captured under 18 tunnel crossing conditions, 78 train meeting conditions, and 3 sonic booms. In addition, changes in oxygenated haemoglobin concentration in the prefrontal and bilateral temporal lobe brain regions of the participants were recorded in real time using a near-infrared brain imaging system. All these data were synchronised to provide accurate reference for in-depth analysis of the comfort of high-speed train passengers.

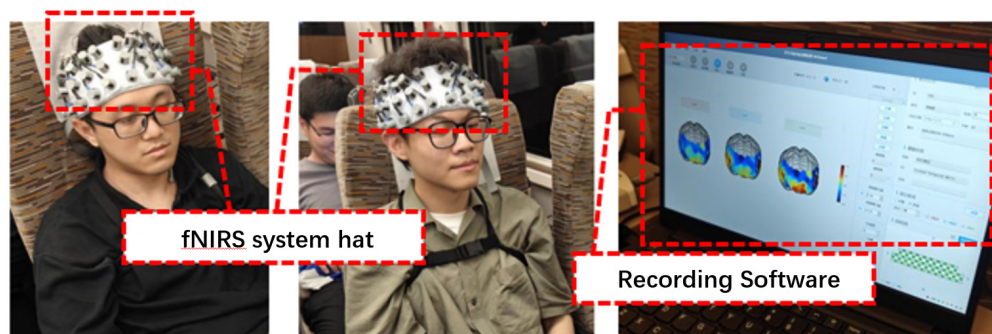


Fig. 2.9 Near-infrared brain imaging recording system

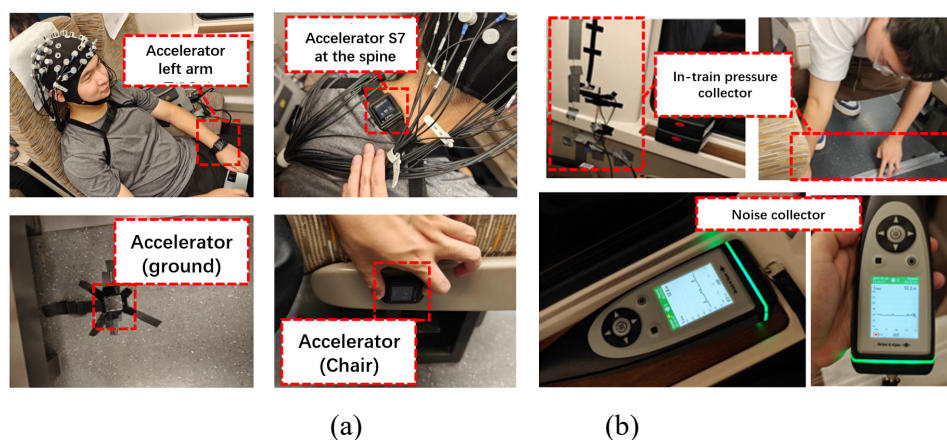


Fig. 2.10 In train environmental recording devices: (a) positions of accelerometers; (b) air pressure sensor and noise recording device

2.2.5 Research on growth of graphene using chemical vapor deposition method

Chemical vapor deposition is a technique to produce thin films on a substrate surface through chemical reactions mainly between several gas-phase compounds and monomers containing thin-film elements. A chemical vapor deposition laboratory for the deposition of graphene thin films on copper substrates was established (Fig. 2.11). The equipment mainly consists of an air inlet control component, a quartz tube, a heating furnace, and a vacuum pump, is used to grow graphene thin films at high temperature ranging from 600°C to 1000°C. The graphene film isolated from the copper substrate can be used in the research of metamaterials, thus achieving the goal of noise reduction. Besides, graphene films isolated from copper substrates can be used for the development of flexible sensors.



Fig. 2.11 Chemical vapor deposition equipment

2.2.6 Research on foreign object intrusion detection technology

Given the limitation in reaction time and vision range of train drivers, it is difficult to avoid collision with foreign objects on the rail track, such as trespassers, animals, rocks, etc. Through drivers' observation, thus leading to potential safety hazards in train operation. Therefore, an automated foreign object intrusion detection system for rail transit operation is necessary to prevent rail transit accidents. However, some key issues limit the actual application of such methods. Such as diversity of the scales of foreign objects, complexity of track trajectories, and specific requirements for long-range and high-speed automated

detection. To overcome the shortcomings of existing methods, a vision-based on-board multi-source data fusion system for foreign object intrusion detection in rail tracks is being developed with CRRC Qingdao Sifang Co., Ltd.

(1) Qingdao Sifang Rolling Stock Factory

From September 21 to 22, 2023, Research Fellow Wen-Qiang Liu, Mr. Gao-Feng Jiang, and Ms. Xin-Yue Xu, members of CNERC-Rail (HK Branch), made a visit to CRRC Qingdao Sifang Co., Ltd. For working out a joint foreign object intrusion detection research project mainly in formulating. The hardware platform and experimental test plan. Dr. Wen-Qiang Liu, a centre member, first introduced the foreign object intrusion detection system hardware platform sensor selection, comparison of critical technical parameters, and research and development plans. Technician Ju-Pang Wang of CRRC Qingdao Sifang Co., Ltd. introduced the data collection situation of the automatic zoom camera installed by the team on the Guiyang-Guangzhou EMU test line (380km/h). Then, the two parties conducted in-depth discussions and demanded docking on the platform's detectable distance, detectable speed, equipment selection, foreign object test plan, etc., and finally formulated the first phase plan for project implementation. After the meeting, centre members visited the test power vehicle used for the project. They measured the vehicle's physical dimensions to select relevant equipment parameters and determine the foreign object layout plan.



Fig. 2.12 On-site communication and research

(2) Wuyi University Railway Vehicle Experimental Field Research and Testing

From November 3-4, 2023, Research Fellow Wen-Qiang Liu, Mr. Gao-Feng Jiang, Ms. Xin-Yue Xu, and Mr. Guang-Zhi Zeng, as CNERC-Rail members, conducted an unmanned aerial vehicle-based data collection test at the rail base of the School of Rail Transportation of Wuyi University. This test aims to use the unmanned aerial vehicle to collect image data simulating various working conditions of foreign objects invading rail lines (including different shooting heights, different foreign object types, different line conditions, and light conditions, etc.) for the establishment and training of the identification model of the rail foreign object intrusion system.

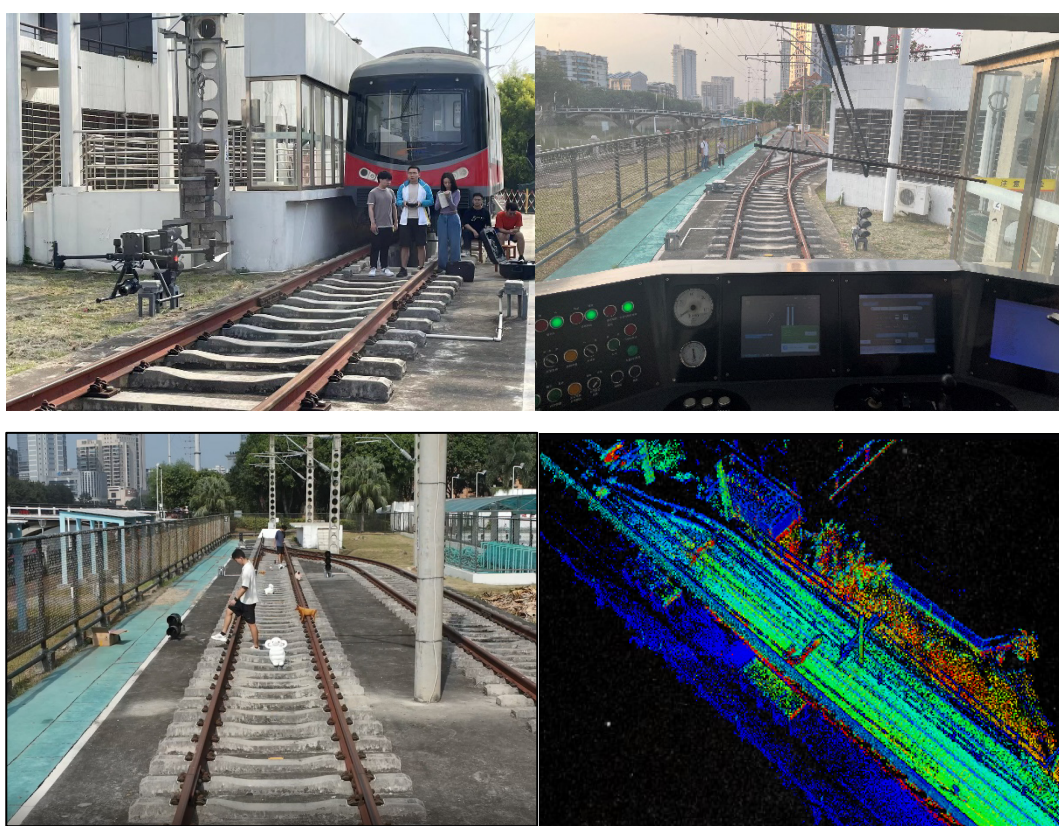


Fig. 2.13 Wuyi University Locomotive Track Experimental Field Data Acquisition

2.2.7 On-site test of Height Valve Connecting Mechanism of Guangzhou Metro Line 14 Vehicles

Since April 2019, there have been multiple incidents of height valve jamming/failure in the GZML14&21 project. Based on the preliminary investigation report and on-site examination findings provided by Zhuzhou Machinery Co, the investigation team consisting of Dr. Zhang Duo, Dr. Zi-yu Tao, Mr Yu-ling Wang, and Guang Zhou. Considered that the jamming and internal wear of the height valves might be related to the following factors: 1.

Initial on-site misalignment of some height valve steering linkages; 2. Rust prevention oil applied to the end ball of the linkage during vehicle assembly impeding the movement of some balls and rotation of the linkage; 3. Incompatibility in performance of local made internal components of the height valve. To tackle the installation and ball head issues, adjustment and comprehensive rectification measures were taken in 2020. Additionally, to reduce the external force transmitted to the valve, a force isolation block was installed at the connection between the operating lever and the valve body by the end of 2020. It has been verified that the above measures have largely solved the internal wear and jamming problems of the height valve.

In the context of the above project, field measurement of the strain and node acceleration of the height valve connecting mechanism was taken. Based on the analysis of the strain measured by Fiber Bragg Grating (FBG) and numerical simulation calculations with measured vibration as excitation, the deformation and force state of the in-service height valve connecting mechanism under different train operating conditions can be identified. This allows monitoring and evaluation of the health status of the measured height valve connecting mechanism.



Fig. 2.14 On-site photos

2.2.8 Performance test and analysis of carbon fiber composite ATC antenna beams for steering racks

Mr Xiang-Xiong Li and Mr. Guang Zhou, from the centre conducted systematic tests on the performance of carbon fiber composite ATC antenna beams for bogies. Fig. 2.15 shows the schematic diagram of the platform setup for experiment being conducted. The test component is an antenna beam used for locomotive bogies, which is made of carbon fiber reinforced polymer composite. Sixty FBG sensors (58 effective sensors) are fixed to the antenna beam and numbered. These sensors are connected to a fiber Bragg grating demodulator, with a sampling frequency set at 5000Hz. The antenna beams bottom side denoted at B-side, top side at T-side, protruding side at mid-span as F-side, and non-protruding side at mid-span as R-side is fixed at both ends to the vibration table using fixtures, which applies loads to the antenna beam. Fig. 2.16 shows the arrangement of the FBG sensors. The sensors within the red dashed box in Fig. 2.16 are selected for subsequent data analysis.

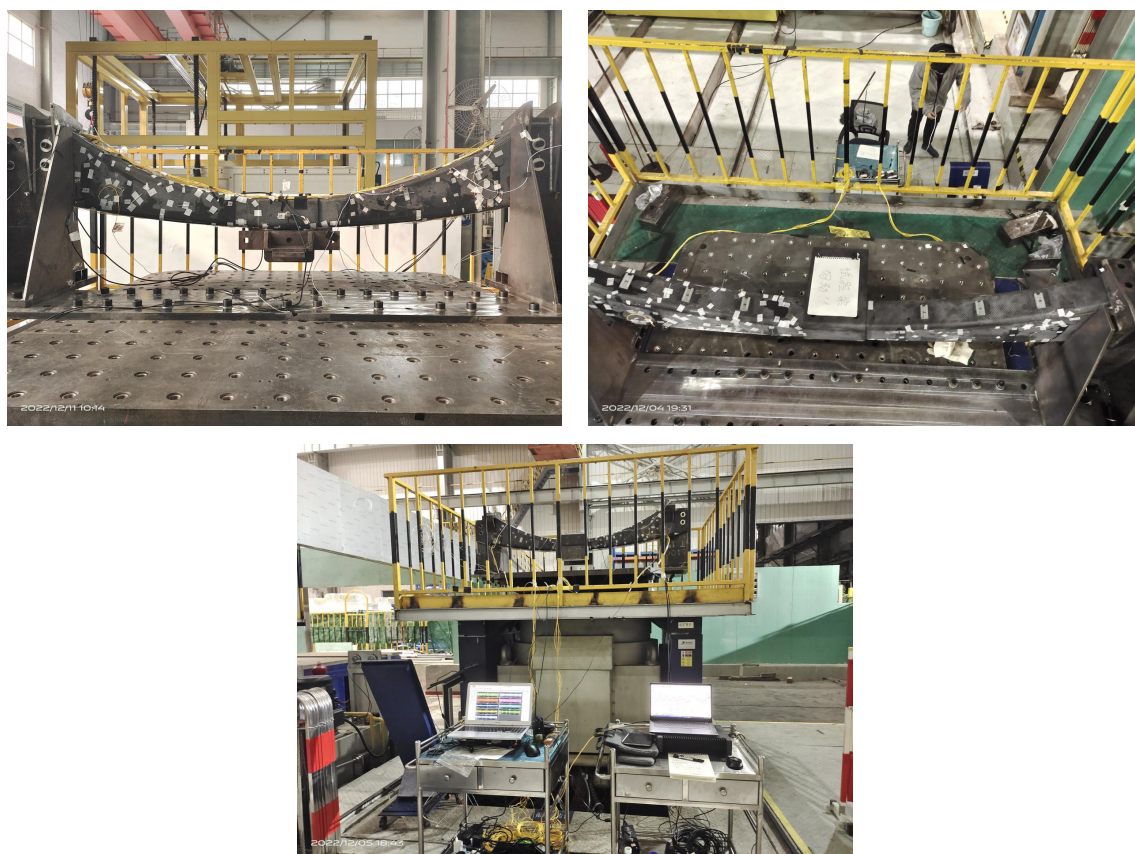


Fig. 2.15 Test platform effect diagram

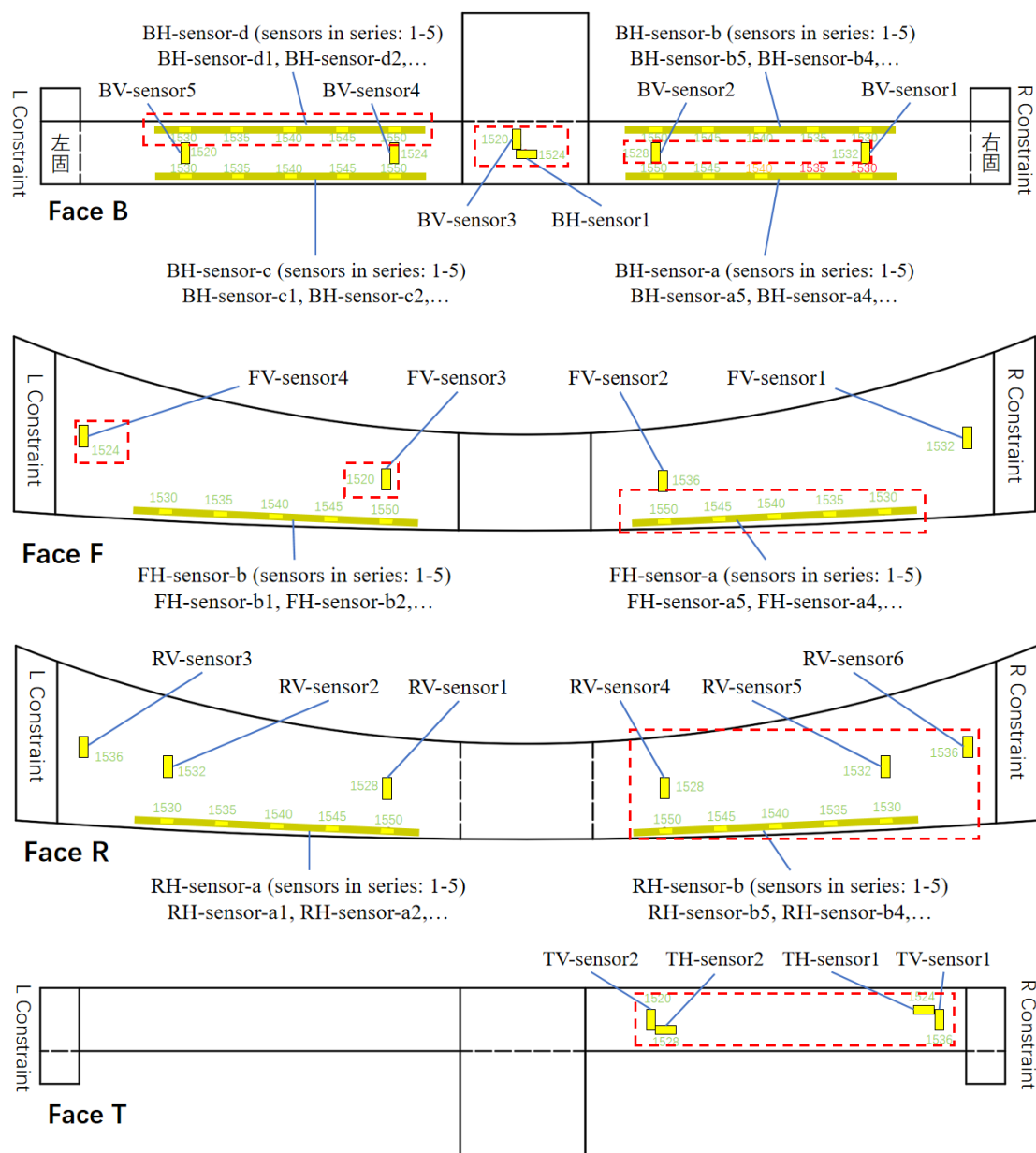


Fig. 2.16 Sensor Layout

2.3 Research Outcomes

In 2023, CNERC-Rail (HK Branch) published 72 SCI papers, 6 keynote reports, attended 30 international conferences, received 4 awards, and 7 authorized patents.

2.3.1 International Journal Publications

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 11. Luo, Y.K., Song, L.Z., Zhang, C., and Ni, Y.Q. (2023), “Experimental evaluation and numerical interpretation of various noise mitigation strategies for in-service elevated suburban rail”, *Measurement: Journal of the International Measurement Confederation*, Vol. 219, Paper No. 113276. <https://doi.org/10.1016/j.measurement.2023.113276> (SCI)
 12. Deng, E., Yue, H., Liu, X.Y., and Ni, Y.Q. (2023), “Aerodynamic impact of wind-sand flow on moving trains in tunnel-embankment transition section: from field testing to CFD modeling”, *Engineering Applications of Computational Fluid Mechanics*, Vol. 17, Paper No. 2279993. <https://doi.org/10.1080/19942060.2023.2279993> (SCI)
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 63. Zhu, Z., Lu, J., and Zhu, S.Y. (2023), “Multi-rate Kalman filtering for structural dynamic response reconstruction by fusing multi-type sensor data with different sampling frequencies”, *Engineering Structures*, Vol. 293, Paper No. 116573. <https://doi.org/10.1016/j.engstruct.2023.116573> (SCI)
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2.3.2 Theme Reports

1. Ni, Y.Q. (2023), Keynote speaker: the 3rd National Academic Symposium on Vehicle-Bridge Coupled Vibration and Its Applications, April 15-16, 2023, Changsha, China. (Fig. 2.17)



Fig. 2.17 Professor Yi-Qing Ni giving a keynote report at the 3rd National Academic Symposium on Vehicle-Bridge Coupled Vibration and Its Applications

2. Ni, Y.Q. (2023), Keynote speaker: the 9th National Academic Conference on Structural Vibration Control and Health Monitoring, May 12-14, 2023, Changsha, China.
3. Ni, Y.Q. (2023), Keynote speaker: the First Greater Bay Area Modern Rail Transit Technology Academic Forum (Bay Area Forum) and the Third Guangdong-Hong Kong-Macao Greater Bay Area Modern Rail Transit Collaborative Innovation Centre Annual Conference, May 27-28, 2023, Guangzhou, China. (Fig. 2.18)



Fig. 2.18 Professor Yi-Qing Ni giving a keynote report at the First Greater Bay Area Modern Rail Transit Technology Academic Forum (Bay Area Forum) and the Third Guangdong-Hong Kong-Macao Greater Bay Area Modern Rail Transit Collaborative Innovation Centre Annual Conference

4. Ni, Y.Q. (2023), Keynote speaker: 3rd International Workshop on Structural Health Monitoring for Railway System, October 17-18, 2023, Qingdao, China.
5. Ni, Y.Q. (2023), Keynote speaker: 12th International Conference on Structural Health Monitoring for Intelligent Infrastructure (SHMII-12), October 19-21, 2023, Hangzhou, China.
6. Ni, Y.Q. (2023), Keynote speaker: YRGS 2023 10th Asia-Pacific Young Researchers and Graduates Symposium, December 7-8, 2023, Perth, Australia.

2.3.3 International Conferences

1. Li, H.W., Ni, Y.Q., Wang, Y.W., Chen, Z.W., Rui, E.Z., and Xu, Z.D. (2023), “State-integration neural network for modeling of forced-vibration systems”, *The 29th International Conference on Computational & Experimental Engineering and Sciences (ICCES2023)*, May 26-29, 2023, Shenzhen, China.
2. Chen, Z.W., Ni, Y.Q., and Zeng, G.Z. (2023), “Enhancing effect of leeward side deflector on high-speed trains aerodynamic performance under crosswinds”, *The 29th International Conference on Computational & Experimental Engineering and Sciences (ICCES2023)*, May 26-29, 2023, Shenzhen, China.
3. Zeng, G.Z., Chen, Z.W., Ni, Y.Q., and Li, Z.W. (2023), “Effect of crosswind angle on the surface pressure distribution of intercity trains on viaducts under wind-driven rain environment”, *The 29th International Conference on Computational & Experimental Engineering and Sciences (ICCES2023)*, May 26-29, 2023, Shenzhen, China.

4. Deng, E., Yue, H., Liu, X.Y., and Ni, Y.Q. (2023), “Numerical reconstitution of natural wind field at the tunnel entrance section of HST based on field test and turbulence generator”, *The 29th International Conference on Computational & Experimental Engineering and Sciences (ICCES2023)*, May 26-29, 2023, Shenzhen, China.
5. Hao, S., Wang, S.M., and Ni, Y.Q. (2023), “Kernel ridge regression-based force identification in the time domain”, *Engineering Mechanics Institute Conference 2023*, June 8, 2023, Atlanta, GA, USA.
6. Zhu, Q., Wang, S.M., and Ni, Y.Q. (2023), “An adaptive MADRL approach for cooperative control of nonlinear maglev suspension system”, *EURODYN 2023: XII International Conference on Structural Dynamics 2023*, July 2-5, 2023, Delft, Netherlands.
7. Chen, S.Y., Wang, Y.W., and Ni, Y.Q. (2023), “Removal of gross outliers in structural dynamic response data via Hankel-structured robust principal component analysis”, *EURODYN 2023: XII International Conference on Structural Dynamics 2023*, July 2-5, 2023, Delft, Netherlands.
8. Jiang, G.F., Wang, S.M., and Ni, Y.Q. (2023), “Maglev suspension controller failure identification based on convolutional neural network”, *EURODYN 2023: XII International Conference on Structural Dynamics 2023*, July 2-5, 2023, Delft, Netherlands.
9. Hao, S., Li, H.W., Jiang, G.F., Wang, S.M., and Ni, Y.Q. (2023), “Vibration-based damage identification in uniform beam-type structures: bypassing the need for initial structural parameters”, *11th Cross-strait Workshop on Monitor and Control in Civil Engineering*, July 3-6, 2023, Hong Kong, China
10. Zhang, W.J., Yuan, X.F., Ni, Y.Q., and Wang, S.M. (2023), “Neural ODE-based data-driven approach for prediction of the creep behavior of steel cables”, *The Symposium of the International Association for Shell and Spatial Structures 2023 (IASS 2023)*, July 10-14, 2023, Melbourne, Australia.
11. Chen, Z.W., Zeng, G.Z., and Ni, Y.Q. (2023), “Influence of flow deflector on aerodynamic characteristics of the maglev train under crosswind environment”, *The 11th National Academic Conference on Maglev Technology and Vibration Control (CSMLTVC11)*, August 4-7, 2023, Changsha, China.
12. Zhang, W.J., Ni, Y.Q., Yuan, L., Hao, S., and Wang, S.M. (2023), “Structural parameter identification with a physics-informed neural networks-based framework”, *The 14th International Workshop on Structural Health Monitoring (IWSHM2023)*, September 12-14, 2023, Stanford, USA.

13. Li, H.W., Ni, Y.Q., Wang, Y.W., Chen, Z.W., and Rui, E.Z. (2023), “Continuous-time state-space neural network and its application in modeling of forced-vibration systems”, *The 14th International Workshop on Structural Health Monitoring (IWSHM2023)*, September 12-14, 2023, Stanford, USA.
14. Hao, S., Wang, S.M., Chen, Z.W., Zhang, W.J., and Ni, Y.Q. (2023), “Inverse reconstruction of unsteady aerodynamic loads acting on railway vehicles”, *The 14th International Workshop on Structural Health Monitoring (IWSHM2023)*, September 12-14, 2023, Stanford, USA.
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17. Zheng, Y.L., Wang, Y.W., and Ni, Y.Q. (2023), “Wayside acoustic fault diagnosis of train wheelset bearing based on improved frequency sparsity bayesian learning”, *The 14th International Workshop on Structural Health Monitoring (IWSHM2023)*, September 12-14, 2023, Stanford, USA.
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20. Chen, S.Y., Wang, Y.W., and Ni, Y.Q. (2023), “Hyperspectral imaging applied for pixel-level crack detection with background interferences”, *The 14th International Workshop on Structural Health Monitoring (IWSHM2023)*, September 12-14, 2023, Stanford, USA.
21. Wang, S.M., Lu, Y., Ni, Y.Q., and Wang, Y.W. (2023), “Technology innovation in developing the health monitoring cloud platform for maglev vehicle-suspension-guideway

- coupling system”, *The 14th International Workshop on Structural Health Monitoring (IWSHM2023)*, September 12-14, 2023, Stanford, USA.
22. Wei, Y.H. and Ni, Y.Q. (2023), “An unsupervised crack detection approach based on sliding window variational autoencoder”, *The 17th International Conference on Civil, Structural and Environmental Engineering Computing*, August 28-31, 2023, Pécs, Hungary.
 23. Li, G.N. and Or, S.W. (2023), “DRL-based adaptive energy management for hybrid electric storage systems under dynamic spatial-temporal traffic in urban rail transits”, *Proceedings of the 2023 IEEE International Conference on Energy Technologies for Future Grids*, December 3-6, 2023, Wollongong, New South Wales, Australia.
 24. Li, G.N., Or, S.W., and Chan, K.W., “Supervised reinforcement learning-based dynamic online train trajectory optimization for improved operations of urban rail transits”, *Proceedings of the PolyU Research Student Conference 2023*, May 8-9, 2023, Hong Kong, China.
 25. Dash, J. N., Yu, Y., Cheng, X., and Tam, H.Y., “Rectangular polymer fiber accelerometer for pantograph catenary system,” *The 28th International Conference on Optical Fiber Sensors*, November 20-24, 2023, Hamamatsu, Japan.
 26. Xu, H., Cao, J., Cheng, Z., Liang, Z., and Chen, J., “Design and Development of a Deformable In-Pipe Inspection Robot for Various Diameter Pipes,” *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, October 1-5, 2023, Michigan, USA.
 27. Yaw, Z., Zhou, W., Chen, Z., Lai, S.K., and Lim, C.W., “Adaptive coding metasurface with broadband switchable functionalities”, *Proceedings of the 5th International Conference on Modeling in Mechanics and Materials*, December 8-10, 2023, Guangxi, China.
 28. Zhang, Y.T., and Lai, S.K., “Self-powered metamaterials designed by membrane-like acoustic-driven triboelectric nanogenerator”, *Proceedings of the 5th International Conference on Modeling in Mechanics and Materials*, December 8-10, 2023, Guangxi, China.
 29. Yang, Z.C., and Lai, S.K., “Electro-induced nonlinear vibration of graphene reinforced dielectric porous arches”, *Proceedings of the 5th International Conference on Modeling in Mechanics and Materials*, December 8-10, 2023, Guangxi, China.
 30. Song, Z.W., and Lai, S.K., “From macro- to nano-scale structures: Two-dimensional refined modeling for partially cracked plates under thermal effect”, *Proceedings of the 5th*

International Conference on Modeling in Mechanics and Materials, December 8-10, 2023, Guangxi, China.

2.3.4 Patents and Awards

1. Chinese invention patent “A data-driven train bearing fault diagnosing method” (Inventors: Yuan-Hao Wei; You-Wu Wang; Yi-Qing Ni; You-Liang Zheng; Patent number: ZL202310167675.4; Grant date: June 16, 2023) (Fig. 2.19 left)
2. Chinese invention patent “An intelligent power supply-free ballastless track slab arch deformation state monitoring method” (Inventors: You-Wu Wang; Yi-Qing Ni; Jia-Ju He; You-Dong Liang; Jia Xu; Patent number: ZL202211603122.0; Grant date: April 14, 2023) (Fig. 2.19 right)
3. Chinese Practical Innovation Patent “An intelligent power supply-free ballastless track plate arch deformation state monitoring system” (Inventors: You-Wu Wang; Yi-Qing Ni; Jia-Ju He; You-Dong Liang; Jia Xu; Patent number: ZL202223379680.1; Authorization date: March 3, 2023) (Fig. 2.20 left)
4. Chinese invention patent “A train bearing fault diagnosing method based on Bayesian blind source separation technology” (Inventors: You-Wu Wang; Yi-Qing Ni; You-Liang Zheng; Patent number: ZL202310015478.0; Grant date: June 20, 2023) (Fig. 2.20 right)
5. Chinese invention patent “A non-supervised crack identification method based on sliding window variational autoencoder” (Inventors: Yuan-Hao Wei; Yi-Qing Ni; You-Wu Wang; Patent number: ZL202310935992.6; Grant date: November 3, 2023) (Fig. 2.21 left)
6. Chinese Practical Innovation Patent “A train bearing fault diagnosis device based on trackside acoustics” (Inventors: You-Wu Wang; Yi-Qing Ni; You-Liang Zheng; Patent number: ZL202320058143.2; Authorization date: June 23, 2023) (Fig. 2.22 right)
7. Chinese Practical Innovation Patent “Optical fiber sensor and magnetic field strength measurement device” (Inventors: Kenneth Lai; Su-Mei Wang; Yi-Qing Ni; Patent number: ZL202223449319.1; Authorization date: August 4, 2023) (Fig. 2.22 left)
8. In June 2023, Professor Yi-Qing Ni won the Dean’s Award for Outstanding Achievement in Research Funding 2023. (Fig. 2.22 right)
9. In July 2023, Mr. Shuo Hao won the first prize in the 11th (2023) Cross-Strait Teachers and Students Civil Engineering Monitoring and Control Seminar Student Competition (Fig. 2.23 left)

10. In October 2023, Mr. Shuo Hao and Mr. Gao-Feng Jiang won the Honorable Mention of the 1st International Competition on Structural Health Monitoring for Railway System (Fig. 2.23 right)
11. Dr. E Deng won the Third Prize at the 3rd International Competition for Structural Health Monitoring (Fig. 2.24)
12. Prof. Song-Ye Zhu's student won the Best Paper Runner-up Award of The Hong Kong Polytechnic University (Fig. 2.25)



Fig. 2.19 Patent certificates: A data-driven train bearing fault diagnosing method (left); An intelligent power supply-free ballastless track slab arch deformation status monitoring method (right)



Fig. 2.20 Patent certificates: An intelligent power supply-free ballastless track slab arch deformation status monitoring system (left); A train bearing fault diagnosing method based on Bayesian blind source separation technology (right)



Fig. 2.21 Patent certificates: An unsupervised crack identification method based on sliding window variational autoencoder (left); A fault diagnosis device for train bearings based on trackside acoustics (right)



Fig. 2.22 Patent and Award certificates: Optical fiber sensor and magnetic field strength measurement device (left); Dean’s Award for Outstanding Achievement in Research Funding 2023 (right)



Fig. 2.23 Certificates of Honor and Achievement: The first prize in the 11th (2023) Cross-Straits Teachers and Students Civil Engineering Monitoring and Control Seminar Student Competition (left); Honorable Mention of the 1st International Competition on Structural

Health Monitoring for Railway System (right)



Fig. 2.24 Winning the Third Prize at the 3rd International Competition for Structural Health Monitoring



Fig. 2.25 Winning the Best Paper Runner-up Award of The Hong Kong Polytechnic University

2.3.5 Professional Activities

1. Prof. Yi-Qing Ni, Co-Editor-in-Chief of Journal of Infrastructure Intelligence and Resilience (Publisher: Elsevier); (Fig. 2.26)
2. Prof. Yi-Qing Ni, Co-Editor-in-Chief of Intelligent Transportation Infrastructure (Publisher: Oxford University Press); (Fig. 2.27)
3. Prof. Yi-Qing Ni, Academic Editor of Structural Control and Health Monitoring: An International Journal (Publisher: Wiley & Hindawi Partnership); (Fig. 2.28)
4. Prof. Yi-Qing Ni, Associate Editor of Journal of Vibration and Control (Publisher: SAGE Publications) (SCI); (Fig. 2.29)
5. Prof. Yi-Qing Ni, Associate Editor of Journal of Civil Structural Health Monitoring (Publisher: Springer) (SCI); (Fig. 2.30)
6. Prof. Song-Ye Zhu, Editor of Advances in Structural Engineering (Publisher: SAGE); (Fig. 2.31)
7. Prof. Song-Ye Zhu, Associate Editor of International Journal of Smart and Nano Materials (Publisher: Taylor & Francis); (Fig. 2.32)
8. Prof. Song-Ye Zhu, Guest Editor for Special Issue on “Innovations in Energy Dissipation Devices for Seismic Protection” of Journal of Structural Engineering. (Fig. 2.33)
9. Prof. Zhong-Qing Su, Editor-in-Chief of Journal of Ultrasonics (Publisher: Elsevier); (Fig. 2.34)
10. Prof. Ka-Wai Cheng, Chief Editor of Journal of Frontier Industrial Electronics (Publisher: Frontiers); (Fig. 2.35)
11. Associate Prof. Siu-Kai Lai, Associate Editor of Journal of Vibration Engineering & Technologies (Publisher: Springer); (Fig. 2.36)
12. Prof. Siu-Wing Or, Editorial Board Member of Processes (Publisher: MDPI); (Fig. 2.37)
13. Dr. E Deng and Dr. Zheng-Wei Chen, Guest Editor for Special Issue on “New insights into train aerodynamics” of Applied Sciences. (Fig. 2.38)
14. Dr. E Deng, “The Third Youth Editorial Committee Member” of Journal of Central South University. (Fig. 2.39)

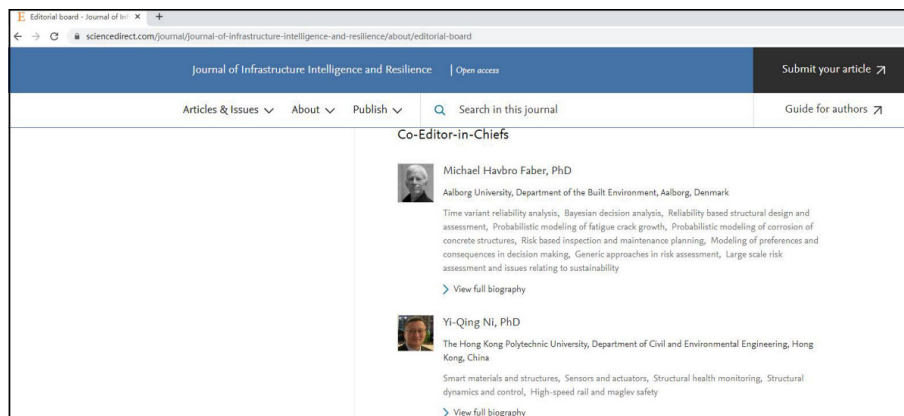


Fig. 2.26 Professor Yi-Qing Ni serving as co-editor-in-chief of Journal of Infrastructure Intelligence and Resilience



Fig. 2.27 Professor Yi-Qing Ni serving as co-editor-in-chief of Intelligent Transportation Infrastructure

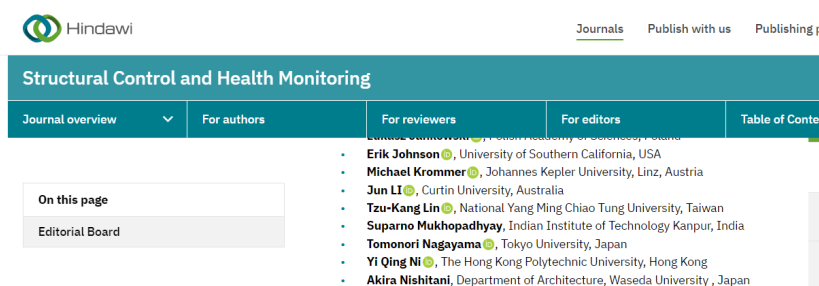


Fig. 2.28 Professor Yi-Qing Ni serving as academic editor-in-chief of Journal of Structural Control and Health Monitoring

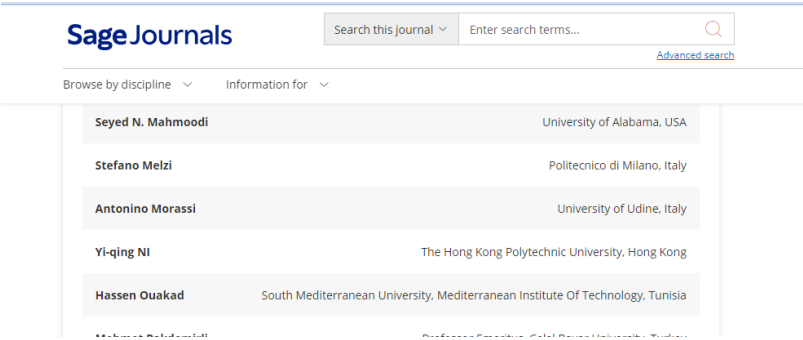


Fig. 2.29 Professor Yi-Qing Ni serving as academic editor-in-chief of Journal of Vibration and Control



Fig. 2.30 Professor Yi-Qing Ni serving as associate editor of Journal of Civil Structural Health Monitoring

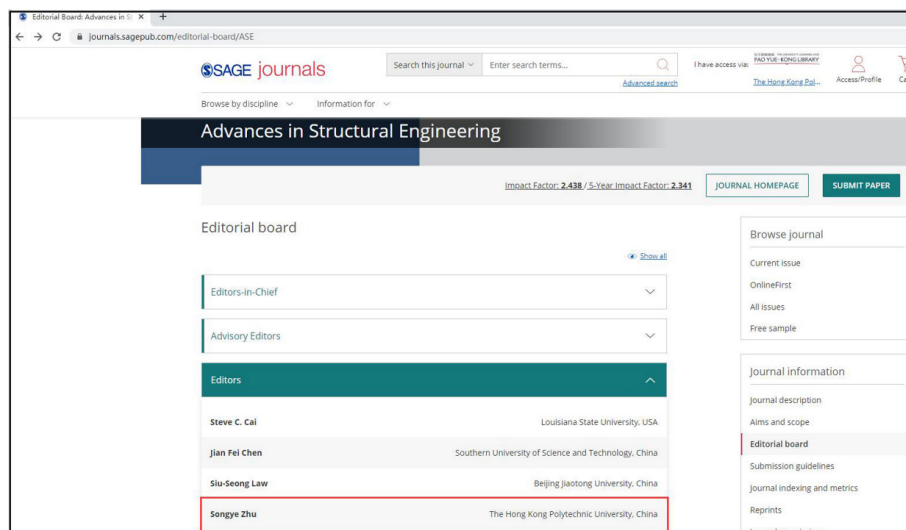


Fig. 2.31 Professor Song-Ye Zhu serving as editor of Journal of Advances in Structural Engineering

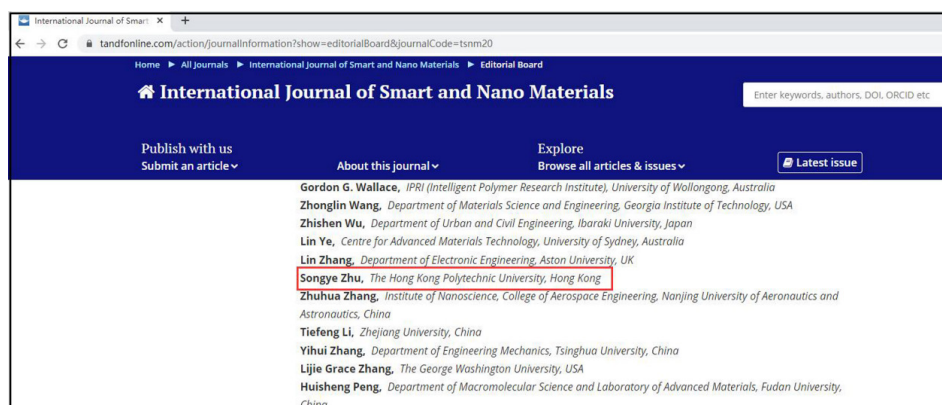


Fig. 2.32 Professor Song-Ye Zhu serving as deputy editor of International Journal of Smart and Nano Materials



Journal of Structural Engineering

Guest Editors:

Professor Songye Zhu, M.ASCE, The Hong Kong Polytechnic University, Hong Kong, China.
E-mail: songye.zhu@polyu.edu.hk
Professor Bin Wang, A.M.ASCE, Sichuan University, Chengdu, China. E-mail: bin.wang@scu.edu.cn
Professor Larry A. Fahnestock, F.ASCE, University of Illinois Urbana-Champaign, Illinois, United States. E-mail: lhfstck@illinois.edu
Professor Theodoros L. Karavasilis, University of Patras, Patras, Greece. E-mail: karavasilis@upatras.gr

Fig. 2.33 Professor Song-Ye Zhu serving as guest editor of Special Issue on “Innovations in Energy Dissipation Devices for Seismic Protection” of Journal of Structural Engineering

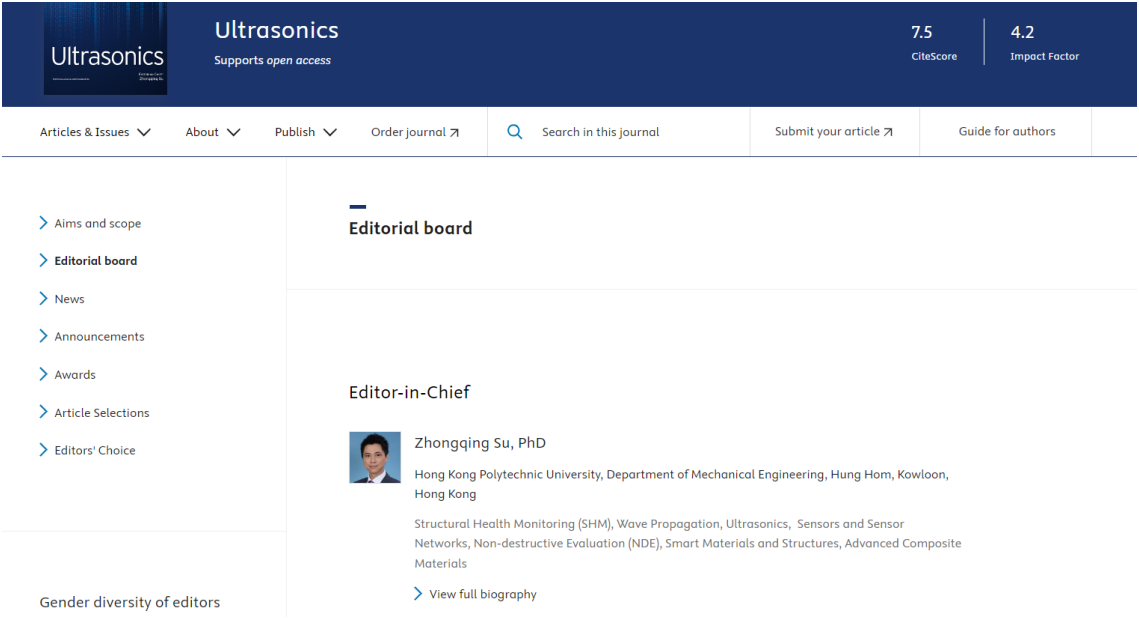


Fig. 2.34 Professor Zhong-Qing Su serving as editor-in-chief of Journal of Ultrasonics

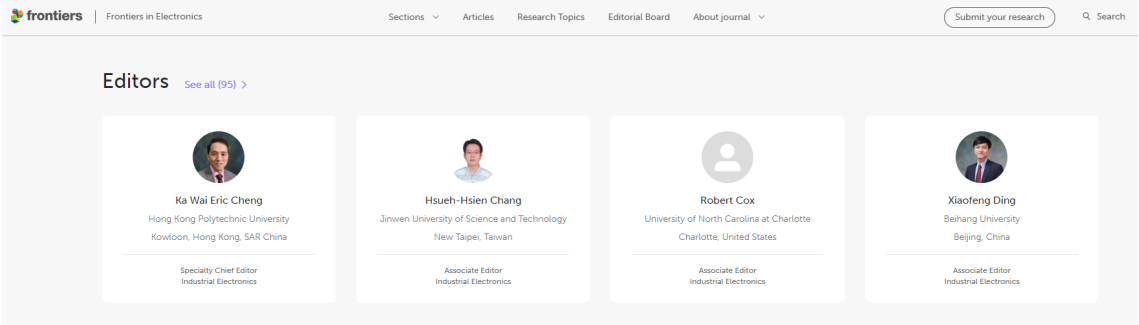


Fig. 2.35 Professor Ka-Wai Cheng serving as special editor-in-chief of Journal of Frontier Industrial Electronics



Fig. 2.36 Associate Professor Siu-Kai Lai serving as associate editor of Journal of Vibration Engineering & Technologies

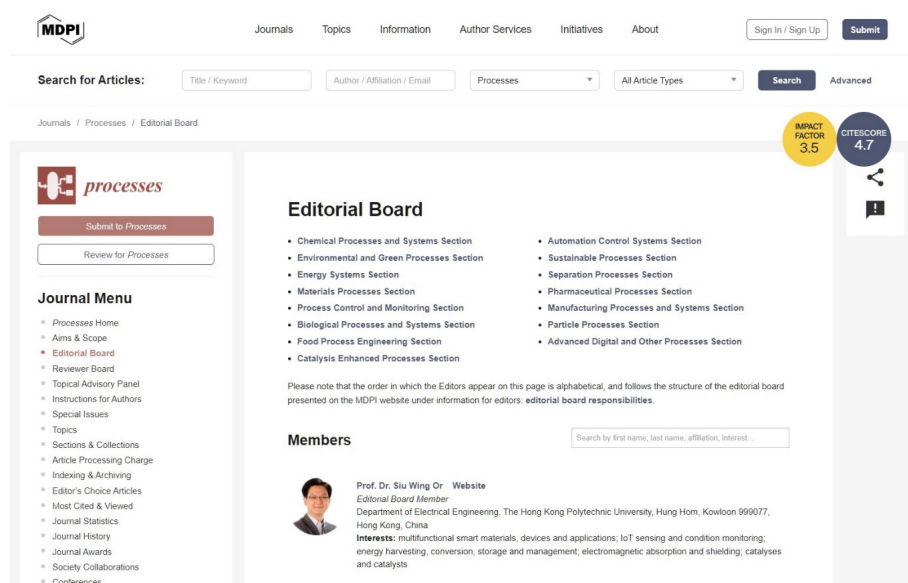


Fig. 2.37 Professor Siu-Wing Or serving as editor of Journal of Processes

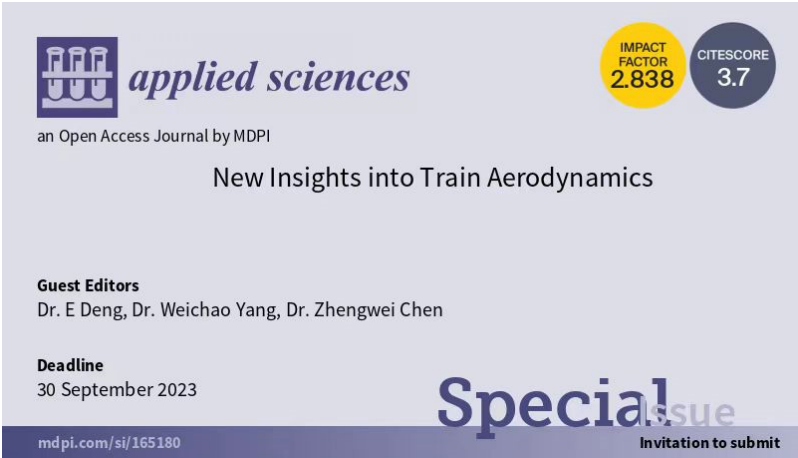


Fig. 2.38 Dr. E Deng and Dr. Zheng-Wei Chen serving as guest editors of Special Issue on “New insights into train aerodynamics” of Applied Sciences



Fig. 2.39 Dr. E Deng serving as “The Third Youth Editorial Committee Member” of Journal of Central South University.

3. Collaborations & Exchanges

3.1 Collaboration Agreements

3.2 Presentations

3.3 Cross Institutes Technical Exchanges

3.4 Organized Seminars

3.5 Visiting Scholars & Delegations

3.6 Media Interview



3. Collaborations & Exchanges

3.1 Collaboration Agreements

3.1.1 Memorandum of cooperation with ITS Branch, Zhejiang Transportation Investment Group Co., Ltd.

On December 8, 2023, CNERC-Rail (HK Branch) signed a 3-year memorandum of cooperation with the ITS Branch, Zhejiang Communications Investment Group Co., Ltd (Fig. 3.1). The scope of cooperation is diversified, covering, collaboration on research and outcome transformation, joint talent development and exchange, contraction of industry innovation platform, promoting the development and transformation of cutting-edge intelligent rail technology, and building an integrated chain of industry, academia, and research.

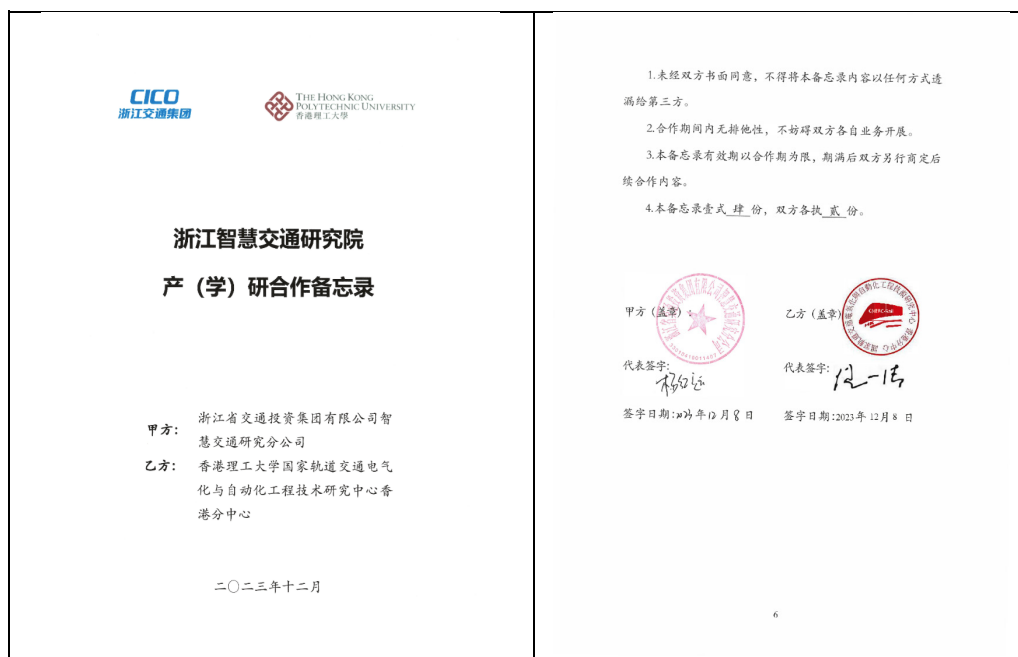


Fig. 3.1 Memorandum of Cooperation between ITS Branch, Zhejiang Transportation Investment Group Co., Ltd. and CNERC-Rail (HK Branch).

3.1.2 Cooperation Agreement with Zhejiang Transportation Investment Group Co., Ltd.

CNERC-Rail (HK Branch) have established a partnership with Zhejiang Communications Investment Group Co., Ltd and signed the 5-year Zhejiang-Hong Kong Research Cooperation Agreement on June 26, 2023 (Fig. 3.2). The cooperation aims to promote scientific research and development of advanced technologies in rail transportation and related areas.

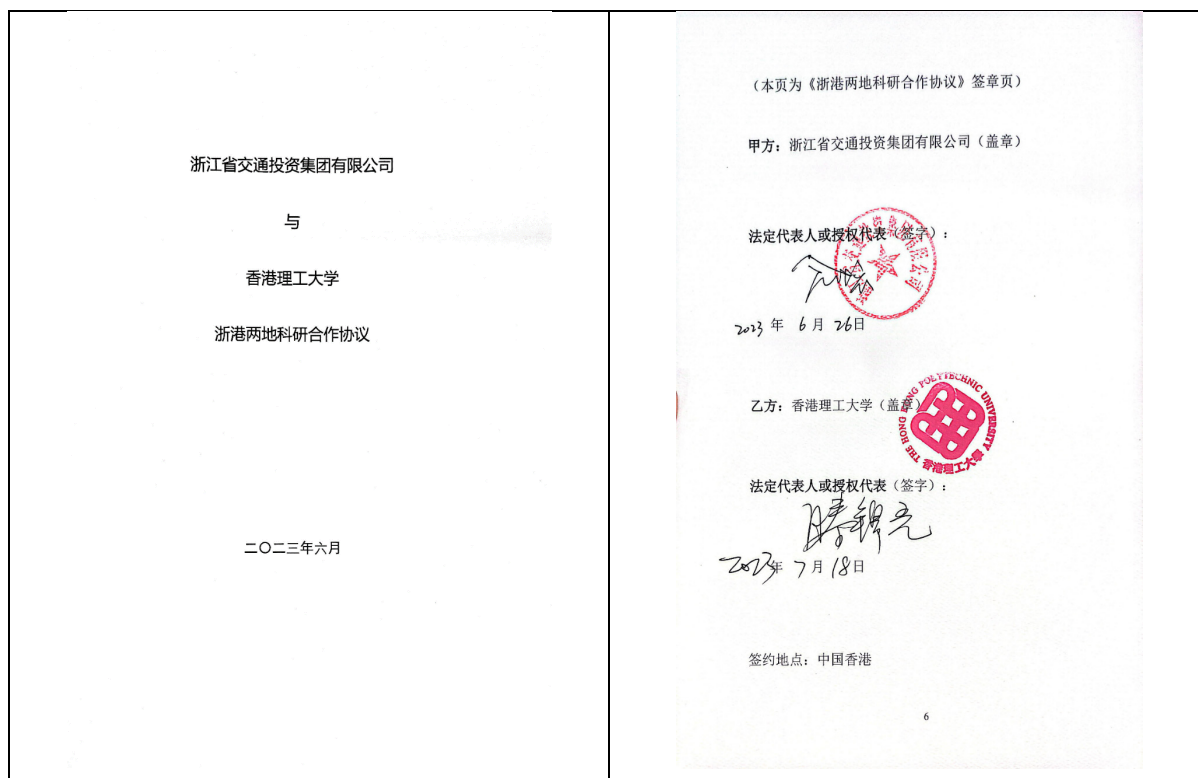


Fig. 3.2 Research Cooperation Agreement between Zhejiang Transportation Investment Group Co., Ltd and CNERC-Rail (HK Branch).

3.1.3 Cooperation Agreement with Zhejiang Rail Operation Management Group Co., Ltd.

CNERC-Rail (HK Branch) have established a partnership with Zhejiang Rail Operation Management Group Co., Ltd. and signed the Zhejiang-Hong Kong Research Cooperation Agreement on June 6, 2023 (Fig. 3.3). This agreement aims to promote scientific research and development of advanced technologies and products in rail transit. The cooperation will be in multi-level, multi-disciplinary, and multi-form forming a model to integrate industry, academia, and research, allowing resource sharing in talent, technology, and information.



Fig. 3.3 Research Cooperation Agreement between Zhejiang Rail Operation Management Group Co., Ltd. and CNERC-Rail (HK Branch).

3.1.4 Cooperation Agreement with Wuyi University and CRRC Guangdong Co., Ltd.

CNERC-Rail (HK Branch) signed a research cooperation agreement with Wuyi University and CRRC Guangdong Co., Ltd in the field of “intelligent robots and high-end equipment manufacturing.” on January 9, 2024 (Fig. 3.4). The cooperation focuses on the research of key technologies for the industrial Internet of Things-driven intelligent lifecycle of intercity EMU (Electric Multiple Unit) trains, aiming to overcome technical bottlenecks in intelligent perception and processing of data, digital design, intelligent manufacturing, and achieving intelligent operation and predictive maintenance throughout the lifecycle of intercity EMU trains.

Fig. 3.4 Cooperation Agreement amongst CNERC-Rail (HK Branch), Wuyi University, and CRRC Guangdong Co., Ltd.

CNERC-Rail (HK Branch) signed a Cooperation Agreement to build an ADPR-PolyU Joint Laboratory for Disaster Prevention and Reduction Technology with Shenzhen Academy of Disaster Prevention and Reduction on May 19, 2023 (Fig. 3.5), based on the principles of complementary advantages, equality, mutual benefit, and long-term cooperation. This agreement aims to promote scientific research and development of advanced technologies in the field of disaster prevention and reduction.

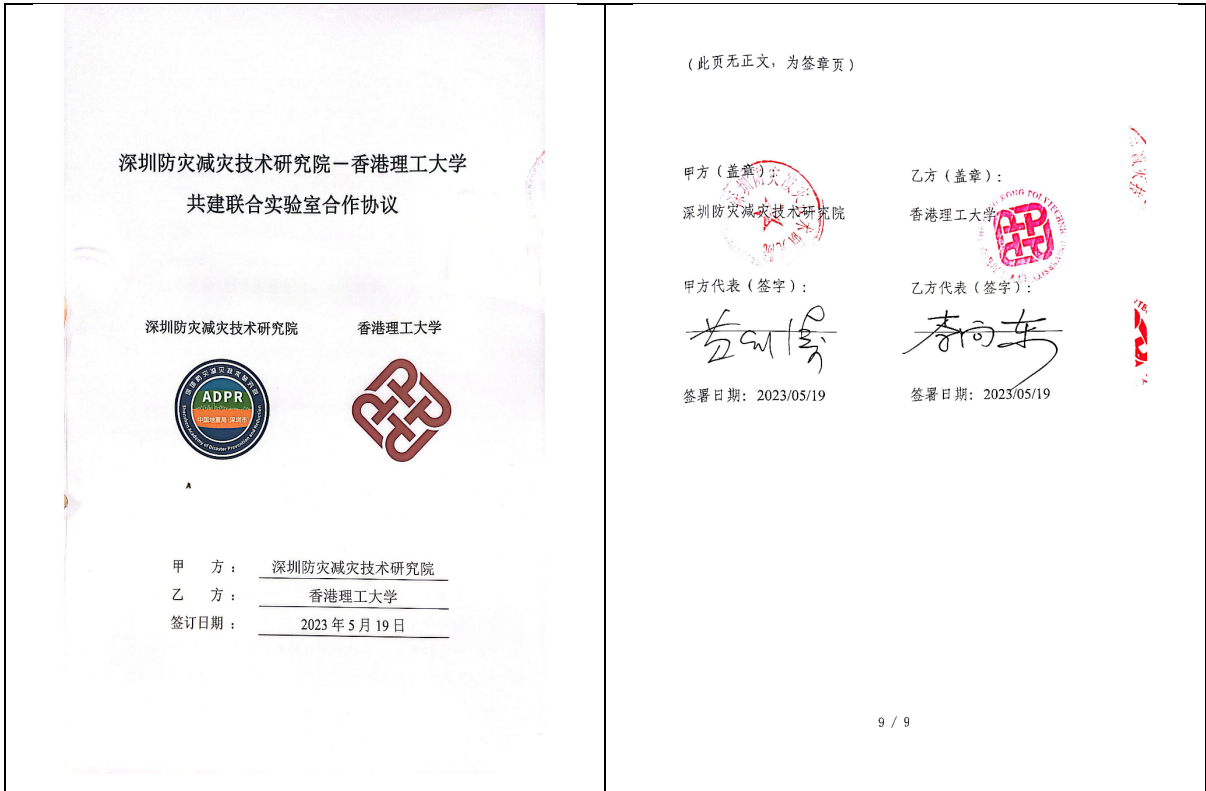


Fig. 3.5 Cooperation Agreement between CNERC-Rail (HK Branch) and Shenzhen Academy of Disaster Prevention and Reduction.

3.2 Conferences

3.2.1 The 11th Cross-strait Workshop on Monitor and Control in Civil Engineering

The 11th (2023) Cross-strait Workshop on Monitor and Control in Civil Engineering was held on July 3-6, 2023 at The Hong Kong Polytechnic University. Prof. Ruth Chiu, Vice-President of The Hong Kong Polytechnic University, delivered the opening speech and Pro. Yi-Qing Ni, Chair Professor of CNERC-Rail (HK Branch), delivered the welcome speech. More than ten of the Chinese Academy of Sciences and the Chinese Academy of Engineering from many universities in China were invited to give presentations. Prof. Yong-Bin Yang, an expert in structural mechanics and dynamics, a foreign member of the Academy of Sciences, of the Chinese Academy of Engineering, an honorary professor at National Taiwan University, and an honorary dean of the School of Civil Engineering of Chongqing University, made a presentation entitled “Recent Advances in Vehicle Scanning Methods for Bridges”. Zheng-Qing Chen of Hunan University made a presentation entitled “New Technology of Permanent Magnetic Eddy Current Damping and Vibration Damping Buffer”. Hong-Qi Tian from Central South University presented a report entitled “Railway Safety Technology System under High Wind Environment”. Fu-Ming Wang of Sun Yat-sen University presented a report entitled “Exploration and Practice of “Industry-Science-Technology-Education Integration” Shared Platform in Civil Engineering”. Academician Xiang-Sheng Chen of Shenzhen University made a report entitled “Sustainable Development of Urban Rail Transportation in Mainland China”. Academician Qing-Rui Yue from University of Science and Technology Beijing presented a report entitled “Integrated Monitoring and Early Warning Technology System for Urban Safety Risks”. Academician Xi-Gang Zhang, Chief Engineer of China Transportation Construction Group Limited, made a presentation entitled “Major scientific and technological directions and tasks for the safety, longevity and healthy operation and maintenance of long-distance bridges”. Academician. Zhen-Bang Yin from Zhejiang University (Korea Advanced Institute of Science and Technology) gave a lecture entitled “Localized Damage Detection Based on Intelligent Active Sensing: Waveguide and Impedance Methods”. Academician Hong Hao from Guangzhou University gave a lecture entitled “Transportation Infrastructure Condition Monitoring Based on Computer Vision and Mobile Crowd Sensing”. Academician Zhi-Shen Wu from Southeast University made a presentation entitled “Structural Health Monitoring Technology for Accurate Assessment of Structural Diseases and Disasters”. Academician You-

Lin Xu from Southwest Jiaotong University made a presentation entitled “Structural Health Inspection, Monitoring, Digital Twin and Intelligent Operation and Maintenance of Large-span Bridges”. Prof. Jia-Rong Ruan, Dean of Graduate School and Distinguished Professor of Civil and Environmental Engineering, University of Macau, gave a lecture entitled “Decentralized System Identification and Its Application to Bridge Health Monitoring”.



Fig. 3.6 Participants in workshop

In addition, dozens of experts and scholars presented interesting reports on various related subjects.



Fig. 3.7 Prof. Ting-Hua Yi of Dalian University of Technology, recipient of the National Outstanding Youth Fund, gave a lecture on invitation.

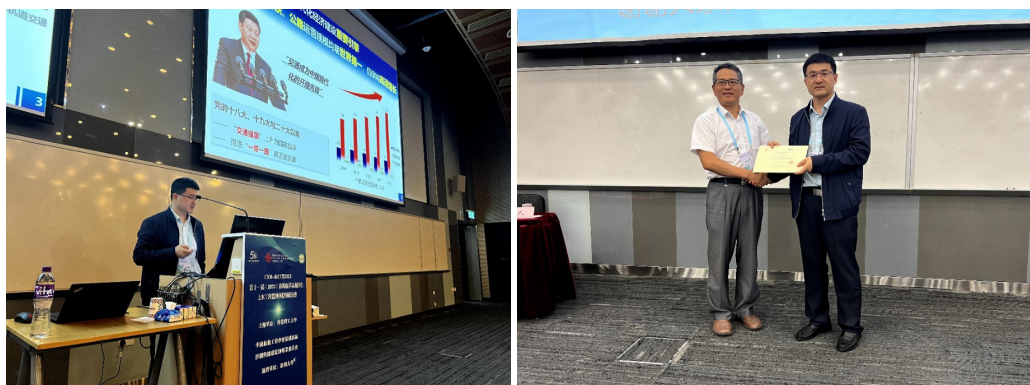


Fig. 3.8 Prof. Li-Ping Li, Dean of Qilu College of Transportation, Shandong University, presenting a special report

Large number young scholars and students amounting to over 120 actively enrolled in the Youth Forum Competition and Student Paper Competition. The main topics include: (1) Health Monitoring of Civil Engineering Structures; (2) Vibration Control of Civil Engineering Structures; (3) Disaster Prevention and Mitigation of Civil Engineering Structures; (4) Monitoring and Control of Civil Engineering Construction; (5) Civil Engineering Sustainability and Urban Disaster Resistant Toughness; (6) Whole Life Cycle Performance Evaluation of Civil Engineering Projects; (7) Smart Cities and Intelligent Infrastructures; (8) Operation, Maintenance and Maintenance Techniques of Railway Vehicles and Infrastructure; (9) Mechanisms and Monitoring of Cross-Sea Projects; and (10) Teaching and Learning. (8) Railway Vehicle and Infrastructure Operation and Maintenance Technology; (9) Disaster Prevention and Mitigation Mechanisms and Monitoring of Cross-Sea Engineering; (10) Research on Teaching Methods and Cultivation of Innovative Capabilities; (11) Typical Engineering Demonstration and Application.





Fig. 3.9 Participants in Youth Forum Competition and Student Paper Competition

3.2.2 The 29th International Conference on Computational & Experimental Engineering and Sciences (ICCES2023)

The 29th International Conference on Computational & Experimental Engineering and Science was held in Shenzhen, China, from 26 to 29, May, 2023. This conference provided a platform for the presentation and dissemination of the latest outcomes from research and developments in theoretical, analytical, computational, and experimental studies in various fields such as physical, chemical, biological, mechanical, electrical, and mathematical sciences. ICCES 2023 was primarily geared towards strengthening ties and encouraging interaction among highly talented individuals in engineering, life sciences, and physical sciences, promoting research at their interfaces, so that the fast-paced developments in these disciplines can be quickly transformed into engines for enhancing global economic growth.

Dr. Hong-Wei Li, a Research Assistant Professor of CNERC-Rail (HK Branch), attended the Structural Health Monitoring Session of ICCES 2023 and gave a presentation entitled “State-integration Neural Network for Modeling of Forced-vibration Systems”.

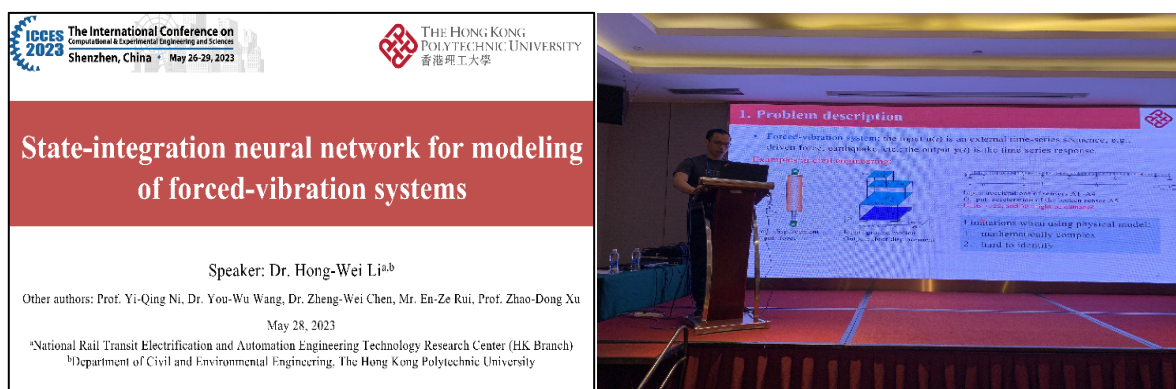


Fig. 3.10 Presentation by Dr. Hong-Wei Li at ICCES 2023

Dr. Zheng-Wei Chen, a Research Assistant Professor of CNERC-Rail (HK Branch), attended the Numerical and Experimental Study on Vehicle Aerodynamics Session of ICCES 2023 and gave a presentation entitled “Enhancing effect of leeward side deflector on high-speed trains aerodynamic performance under crosswinds”.



Fig. 3.11 Presentation by Dr. Zheng-Wei Chen at ICCES 2023

Dr. E Deng, a Postdoctoral Fellow of CNERC-Rail (HK Branch), attended the Numerical and Experimental Study on Vehicle Aerodynamics Session of ICCES 2023 and gave a presentation entitled “Numerical reconstruction of natural wind field at the tunnel entrance section of HSR based on field test and turbulence generator”.



Fig. 3.12 Presentation by Dr. E Deng at ICCES 2023

Mr. Guang-Zhi Zeng, a Research Assistant of CNERC-Rail (HK Branch), attended the Numerical and Experimental Study on Vehicle Aerodynamics Session of ICCES 2023 and gave a presentation entitled “Effect of crosswind angle on the surface pressure distribution of intercity trains on viaducts under wind-driven rain environment”.



Influence of crosswind angle on the surface pressure distribution of intercity trains on viaducts under wind and rain environment

Guang-Zhi Zeng, Zheng-Wei Chen, Yi-Qing Ni, Zhi-Wei Li

Department of Civil and Environmental Engineering,
The Hong Kong Polytechnic University, Hong Kong, China;
National Engineering Research Center on Rail Transit Electrification and
Automation (Hong Kong Branch), Hong Kong, China
29 May 2023, Shenzhen



Fig. 3.13 Presentation by Mr. Guang-Zhi Zeng at ICCES 2023

3.2.3 The 12th International Conference on Structural Dynamics (EURODYN 2023)

The 12th European International Conference on Structural Dynamics was held on June 2-5, 2023 in Delft, the Netherlands. The European International Conference on Structural Dynamics (EICSD) is one of the most important international conferences in the field of structural dynamics organized by the European Association for Structural Dynamics (EASD) for sharing cutting-edge research results in various fields of structural dynamics. The conference has been organized every three years since the first one in 1990. This conference attracted nearly 600 participants from 48 countries and regions, covering major research directions in structural dynamics, apart from exchanging outcomes in theoretical, numerical and experimental research in structural dynamics, significant weighting was given to their applications in various structures and dynamical systems.

Ms. Qi Zhu, a PhD candidate of CNERC-Rail (HK Branch), gave a presentation entitled “An adaptive MADRL approach for cooperative control of nonlinear maglev suspension system”.



Fig. 3.14 Presentation by Ms. Qi Zhu at EURODYN 2023

Ms. Si-Yi Chen, a Research Associate, gave a presentation entitled “Removal of Gross Outliers in Structural Dynamic Response Data via Hankel-structured Robust Principal Component Analysis”.



Fig. 3.15 Presentation by Ms. Si-Yi Chen at EURODYN 2023

Mr. Gao-Feng Jiang, a PhD student, gave a presentation entitled “Fault Identification of Maglev Controller Based on Convolutional Neural Network”.



Fig. 3.16 Presentation by Mr. Gao-Feng Jiang at EURODYN 2023

3.2.4 The 5th High-speed Railway Health Management Technology Forum

The 5th High-Speed Railway Health Management Technology Forum was held on June 9-11, 2023 in Chengdu. Under the theme of new technology of high-speed railroad infrastructure health management, there were three thematic sub-forums, namely “Intelligent Operation and Maintenance Technology of High-speed Railway Track Structure”, “Intelligent Management Technology of High-speed Railway Bridges and Structures”, “Health Management and Operation and Maintenance Technology of High-speed Railway Tunnels and Geotechnical Engineering”. A total of 43 experts and scholars from colleges and universities, scientific research institutes, and enterprises presented technical reports.

Dr. You-Wu Wang, a Research Assistant Professor of CNERC-Rail (HK Branch), was invited to give a presentation entitled “Rail Damage Detection Based on Fiber Optic Ultrasonic Guided Wave Technology”.

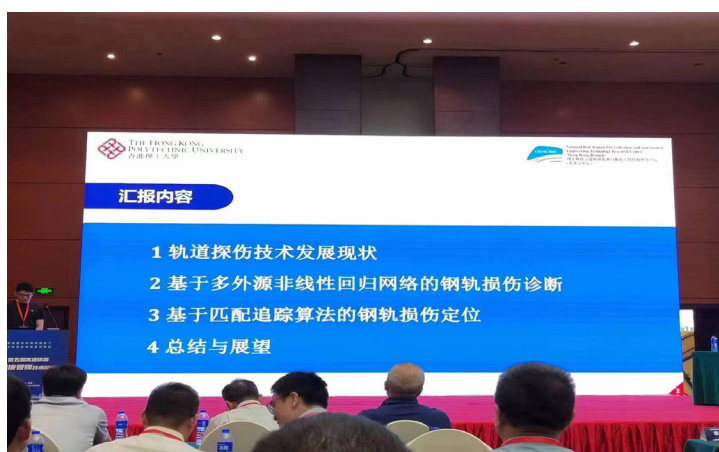


Fig. 3.17 Presentation by Dr. You-Wu Wang at the 5th High-speed Railway Health Management Technology Forum

3.2.5 The 11th National Academic Conference on Maglev Technology and Vibration Control (CSMLTVC11)

The 11th National Academic Conference on Maglev Technology and Vibration Control (CSMLTVC11) was held on August 4-7, 2023, at Changsha and Fenghuang in Hunan. CSMLTVC11 provided an all-round exchange, learning and cooperation platform for universities, enterprises, research institutions, experts and scholars to discuss technical issues and multidisciplinary fusion of magnetic levitation bearings, magnetic levitation transportation and all kinds of magnetic levitation technology and vibration-related technical challenges and development initiatives with reference to cutting-edge intersection, and to explore future

direction of innovation and application of magnetic levitation technologies and vibration control.

Research Assistant Professor Su-Mei Wang, Research Assistant Professor Zheng-Wei Chen, and Ph. D student Ms Qi Zhu of CNERC-Rail (Hong Kong Branch) attended the CSMLTVC11. Dr. Su-Mei Wang was invited to give a presentation entitled “On-line monitoring and levitation control of low- and medium- speed maglev train system”. Dr. Zheng-Wei Chen gave another presentation entitled “Aerodynamic enhancement effect of train leeward side deflector under wind environment: from high-speed train to maglev train”. Ms Qi Zhu also gave a presentation entitled “An adaptive MADRL-HJB approach for cooperative control of nonlinear maglev suspension system”.



Fig. 3.18 Presentations given by Dr. Su-Mei Wang, Dr. Zheng-Wei Chen and Ms. Qi Zhu at CSMLTVC11

3.2.6 The 14th International Workshop on Structural Health Monitoring (IWSHM 2023)

The 14th International Workshop on Structural Health Monitoring (IWSHM 2023) was held on September 12-14, 2023, at Stanford University, USA. The theme of IWSHM 2023 was “Designing SHM for Sustainability, Maintainability, and Reliability.” The workshop covered

major topics in SHM, including sensing technologies, multi-functional materials and structures, signal processing, health management, industry-level Internet of Things, etc.

A total of 10 members of the centre participated in the workshop, giving technical presentations in person, sharing latest research progress, and exchanging ideas in various research topics. Speakers from the centre Dr. Su-Mei Wang, Dr. Hong-Wei Li, Mr. Shuo Hao, Mr. Wei-Jia Zhang, Mr. Yan-Ke Tan, Mr. Gao-Feng Jiang, Mr. Zhen Lin, Mr. You-Liang Zheng, Ms. Si-Yi Chen, and Mr. Da-Zhi Dang.

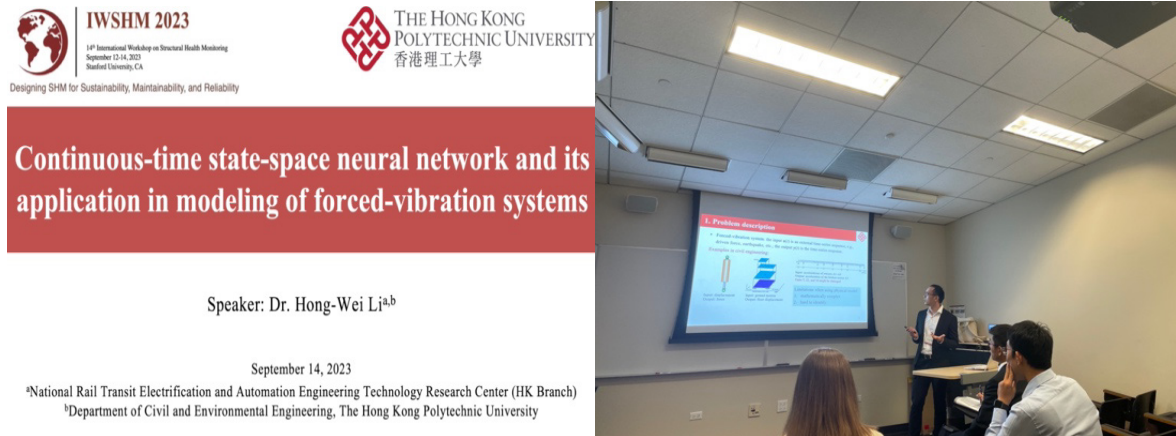


Fig. 3.19 Presentation by Hong-Wei Li in the session on Challenges and Solutions for Long-Term Structural Health Monitoring



Fig. 3.20 Presentation by Shou Hao in the session on Challenges and Solutions for Long-Term Structural Health Monitoring



Fig. 3.21 Presentation by Su-Mei Wang in the session on Challenges and Solutions for Long-Term Structural Health Monitoring

3.2.7 The 17th International Conference on Civil, Structural and Environmental Engineering Computing (CIVIL-COMP 2023)

The 17th International Conference on Civil, Structural, and Environmental Engineering Computing was held in Pécs, Hungary. The Faculty of Engineering and Information Technology of the University of Pécs in collaboration with Civil-Comp Press were the organizers of the international conference. This conference provides a forum for the presentation and dissemination of the latest research and developments in computer applications in civil, structural, and environmental engineering. A primary goal of this conference is to link research and innovation ideas with engineering practice. All presentations address computing applications in civil, structural, and environmental engineering in the broadest sense.

Mr. Yuan-Hao Wei, a Ph.D. candidate of CNERC-Rail (HK Branch), attended the crack identification and prevention in engineering structures session of CIVIL-COMP 2023. Mr. Wei gave a presentation entitled “An Unsupervised Crack Detection Approach Based on a Sliding Window Variational Autoencoder”.

CIVIL-COMP 2023

The Seventeenth International Conference on Civil, Structural and Environmental Engineering Computing

28-31 August 2023

Pécs, Hungary

organised in cooperation with the:
Faculty of Engineering and Information Technology
University of Pécs, Hungary



Fig. 3.22 Topic of presentation by Mr. Yuan-Hao Wei at CIVIL-COMP 2023

3.2.8 The 3rd International Symposium on Health Monitoring of Railway Structures and Innovation Competition

The International Symposium on Structural Health Monitoring of Railway Transportation, as one of the most authoritative academic conferences in the field of structural health monitoring, fault prediction and diagnosis of China's rail transportation, was successfully held for two sessions in 2016 and 2018, which brought together academicians, scholars and technical experts from domestic and foreign countries, and discussed in depth the application and development of the health monitoring technology in the field of rail transportation, and provided an international high-end dialogue platform between academia and industry on the issue of health monitoring and rail transportation. It provides an international high-end dialog platform for health monitoring and rail transit for both academics and industry.

The 3rd International Symposium on Structural Health Monitoring for Railway Transportation, jointly organized by the China Railway Society, China Railway Group Corporation, National High-Speed Train Technology Innovation Centre, National Key Laboratory of High-Speed Magnetic Levitation Transportation Technology, Qingdao Railway Transportation Industry Demonstration Zone Management Committee, and Qingdao Sifang Locomotive and Rolling Stock Co. "The 3rd International Symposium on Structural Health Monitoring of Railway Transportation will be held on October 17-18, 2023 in Qingdao.

Prof. Yi-Qing Ni from National Research Centre for Railway Electrification and Automation (Hong Kong Sub-centre) will attend the 3rd International Symposium on Structural Health Monitoring of Railway Transportation and give a lecture on "Transfer Learning Methods for On-line Damage Monitoring of High-speed Railway and Magnetic Levitation".



Fig. 3.23 Prof. Yi-Qing Ni's report

Dr. Su-Mei Wang, Research Assistant Professor of CNERC-Rail (HK Branch), and PhD students Mr. Gao-Feng Jiang and Mr. Shuo Hao participated in the Innovation Competition and won the third prize.



Fig. 3.24 Third International Symposium on Health Monitoring of Railway Structures and Innovation Competition Awarded

3.2.9 Other Conferences

Other held conferences:

1. Prof. Song-Ye Zhu, Co-Chair, The 6th Huixian International Forum on Earthquake Engineering for Young Researchers, Hong Kong, China. August 6-9, 2023;
2. Prof. Song-Ye Zhu, Co-Chair, The Fourth Young Researchers Symposium on Hazard Mitigation in Civil Engineering, Hong Kong, China, August 4-6, 2023.

Table.3.1 Summary of other attended conferences

Title of the meeting	Host	Venue of the Conference	Time	Speaker
3rd International Forum of Young Scholars in "Intelligent	"Intelligent Transportation Infrastructure"(ITI)	Zoom	January 15,2023	Prof. Yi-Qing Ni

Transportation Infrastructure"(ITI)				
ITI First Research Cutting-edge Forum - ChatGPT	"Intelligent Transportation Infrastructure"(ITI)	Zoom	February 24,2023	Prof. Yi-Qing Ni
The Third National Symposium on Coupled Axle Vibration and Its Applications	Hunan University	Changsha	April 14-15, 2023	Prof. Yi-Qing Ni
The Second Academic Forum on Intelligent Operation and Maintenance of Rolling Stock of East China Jiaotong University	East China Jiaotong University	Nanchang	April 22-23, 2023	Prof. Yi-Qing Ni
The 9th National Academic Conference on Structural Vibration Control and Health Monitoring	Hunan University	Changsha	May 12-14, 2023	Prof. Yi-Qing Ni
The 1st Academic Forum on Modern Railway Transportation Technology in the Greater Bay Area (Bay Area Forum)	Guangdong-Hong Kong-Macao Greater Bay Area Modern Rail Transit Collaborative Innovation Centre	Guangzhou	May 26-28, 2023	Prof. Yi-Qing Ni
CICTP 2023 Pre-Conference and “Academic Summit Forum on Integrated Transportation and Urban Connectivity	Shenzhen University of Technology	Shenzhen	July 8-10, 2023	Prof. Yi-Qing Ni
The 3rd International Symposium on Health Monitoring of Railway Structures	National High-Speed Train Technology Innovation Centre	Qingdao	October 17-18, 2023	Prof. Yi-Qing Ni
The 12th International Conference on Structural Health Monitoring for Intelligent Infrastructure (SHMII-12)	Zhejiang University	Hangzhou	October 19-20, 2023	Prof. Yi-Qing Ni
The First Academic Conference on Safety, Longevity and Healthy Operation and Maintenance of Longer Bridges	National Key Laboratory of Safety, Longevity and Healthy Operation and Maintenance of Growing Bridges	Nanjing	October 21, 2023	Prof. Yi-Qing Ni

The 5th Zhejiang International Intelligent Transportation Industry Expo Rail Transportation Development Forum	Zhejiang Provincial Department of Transportation	Hangzhou	December 1, 2023	Prof. Yi-Qing Ni
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3.3 Cross Institute Technical Exchanges

3.3.1 School of Civil Engineering, Central South University

On January 12, 2023, Dr. Zheng-Wei Chen, Dr. E Deng, and Mr. Huan Yue, members of the CNERC-Rail (HK Branch), held an online meeting with Prof. Wei-Chao Yang's team from the School of Civil Engineering of Central South University. Prof. Wei-Chao Yang introduced his work and experience on train operation safety and protection measures under crosswind situation and explained key design parameters of higher-speed trains and tunnel structures; Dr. Zheng-Wei Chen and Dr. E Deng introduced the online monitoring and control of railway systems studied by the centre turning to specific research on intelligent online monitoring and vibration/noise control of rail transit, the two parties discussed subjects in-depth and exchange technical details.

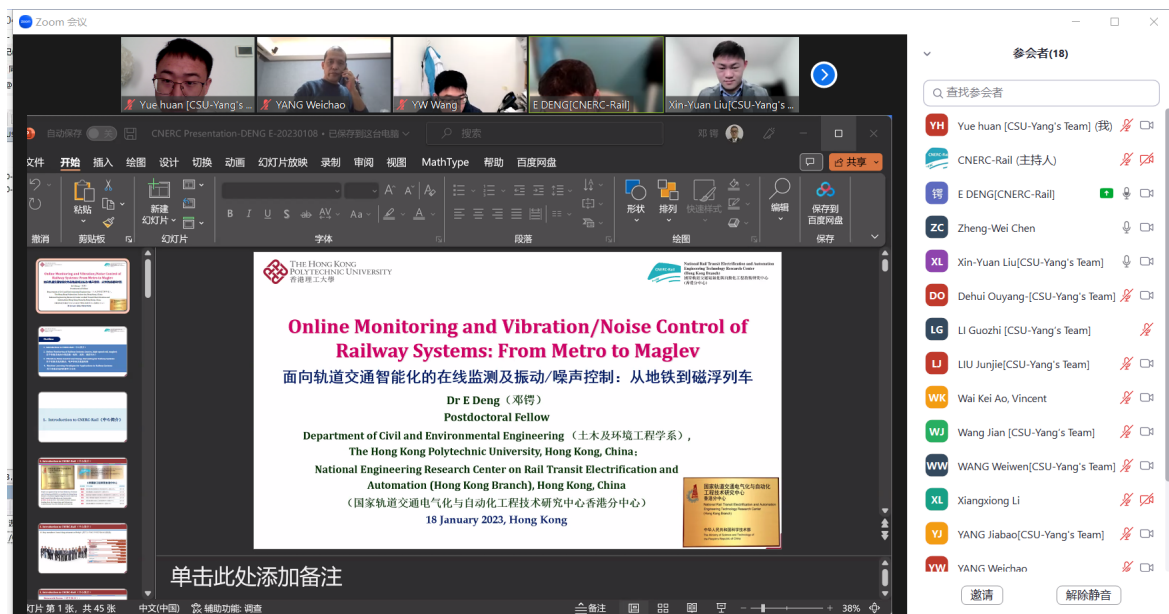


Fig. 3.25 Technical exchange between CNERC-Rail (HK Branch) and School of Civil Engineering of Central South University

On August 4, 2023, Prof. Xu-Hui He from the School of Civil Engineering, Hai-Quan Jing, Deputy Dean of the Shenzhen Research Institute, and other scholars from Central South University visited CNERC-Rail (HK Branch) and Industrial Centre of The Hong Kong Polytechnic University. Dr. Wai-Kei AO (Research Assistant Professor) introduced the latest research work and outcomes of the CNERC-Rail (HK Branch). Members of the CNERC-Rail (HK Branch) then showed the magnetic levitation electromagnet coupling vibration test platform to the visitors. Prof. He expressed great interest in the research work of the CNERC-Rail (HK Branch) and intention of further cooperation between the two parties. On December

29, 2023, Prof. Yi-Qing Ni, Director of the CNERC-Rail (HK Branch), and Dr. Zheng-Wei Chen paid a visit to the School of Civil Engineering of Central South University for technical exchanges.



Fig. 3.26 Members of CNERC-Rail (HK Branch) and visitors from the School of Civil Engineering of Central South University

3.3.2 MTR Corporation Limited

On February 7, 2023, 12 members of the CNERC-Rail (HK Branch) including Dr. You-Wu Wang, Dr. Wei Jiang, Dr. Wen-Qiang Liu, Dr. Zi-Yu Tao, Dr. Duo Zhang, Dr. E Deng, Mr. Qi-Fan Zhou, and Mr. Da-Zhi Dang, etc, went to the MTR Luohu Station for an on-site inspection to confirm the optical fibre transmission distance and junction box location with the designated contractor of the MTR Corporation Limited. Opportunity was taken for a technical exchange with staff of MTR Corporation on optical fibre installation and protection.



Fig. 3.27 Site work and meeting at Luohu Station

3.3.3 Southwest Jiaotong University

On March 30, 2023, Dr. Jian-Mei Zhu, former Vice President of Southwest Jiaotong University and Director of the Railway Operation Safety and Security Engineering Research Centre, Dr. Peng-Xiang Wang, Dean of the Shanghai Research Institute, Dr. Bin Shuai, Professor of the School of Transportation and Logistics, and Professor of the School of Materials Science and Engineering Dr. Min-Hao Zhu, Dr. Peng Yan from Railway Development Co., Ltd. and other scholars visited the CNERC-Rail (HK Branch) and the Industrial Centre of The Hong Kong Polytechnic University.



Fig. 3.28 CNERC-Rail (HK Branch) and delegation from Southwest Jiaotong University

From 5th to 7th September 2023, Prof. Xue-Song Jin and his team members visited CNERC-Rail (HK Branch) and gave lectures on research subjects related to high-speed railway wheel and rail wear control. Prof. Yi-Qing Ni, Dr. Zheng-Wei Chen, and other members of the centre then exchange knowledge and experience with Prof. Xue-Song Jin's team and shared news on future research directions.

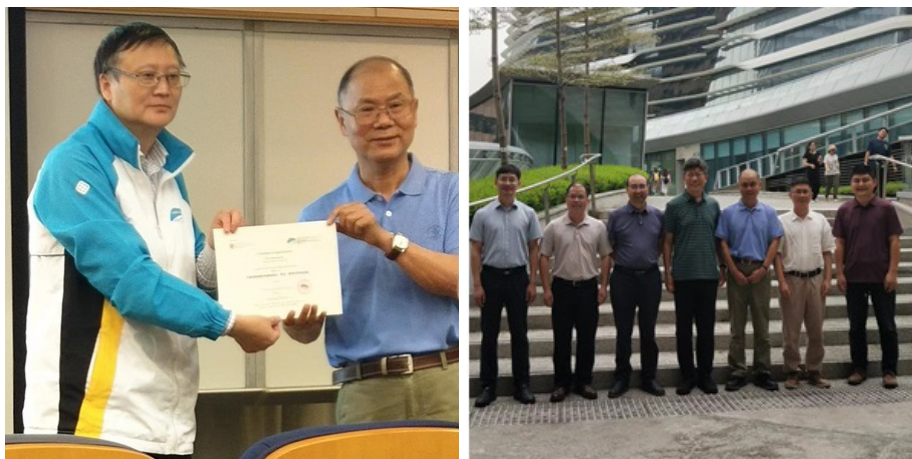


Fig. 3.29 Prof. Xue-Song Jin of Southwest Jiaotong University (left) and his team (right) visiting CNERC-Rail (HK Branch)

3.3.4 China Railway Maglev Transportation Investment and Construction Co., Ltd.

From April 25 to 26, 2023, Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), Dr. Su-Mei Wang, Dr. Zheng-Wei Chen and Mr. Yang Lu visited the Qingyuan Maglev line construction site and met the general manager and staff of China Railway Maglev Transportation Investment and Construction Co., Ltd. Experts in the company introduced the development of Maglev online monitoring system based on Beidou, and optimisation of the system code, both parties exchanged thoughts on promoting the construction of new maglev lines in Zhejiang Province and the Greater Bay Area.



Fig. 3.30 Technical exchange between CNERC-Rail (HK Branch) and China Railway Maglev Transportation Investment and Construction Co., Ltd.

3.3.5 Zhejiang Rail Transit Operation Management Group Co., Ltd

On May 9, 2023, a total of 14 members of CNERC-Rail (HK Branch) visited Zhejiang Rail Group for exchange in rail transit research. Mr. Hong-Yun Yang, Director of the research institute introduced the direction of smart high-speed rail technology, the achievements made and the future vision of the research institute. Members of the centre introduced to the other side an overview of the centre and research work being carried out.

On May 10, 2023, members of CNERC-Rail (HK Branch) visited Zhejiang Hanghai Intercity Railway Co., Ltd. and met Mr. Geng-Guang Xue, deputy general manager of Shenzhen-Zhejiang Digital Intelligence Company and his assistants, Dr. Yu-Chong Wang, and Dr. Han-Xiao Zhou. At the meeting, the two parties exchanged opinions on improving the vehicle data integrated collection system, vehicle movement monitoring subsystem, and 360

degrees vehicle body image detection subsystems. Mr. Xue showed some detailed transformation plans of the bogie system and discussed the feasibility of the system with the centre members.

On May 15, 2023, members of CNERC-Rail (HK Branch) met Mr. Xiao-Xu Shen, Assistant General Manager of Zhejiang Xingfu Rail Company, Mr. Dong Yan, Deputy General Manager of Xingfu Rail Company, Mr. Geng-Guang Xue, Deputy General Manager of Shenzhen Zhejiang Digital Intelligence Company, and Dr. Dong Zou, Head of the postdoctoral workstation. Mr. Dong Yan first gave an overview of Wenzhou Municipal Railway S1 Line, which will be operated and maintained by Xingfu Rail Company. Then the heads of the equipment centre, passenger transportation centre and safety technology department introduced the dual prevention mechanism digital system and track protection digital system, smart customer service centre, digital station concept, achievement goals and construction progress. Dr. Zheng-Wei Chen of CNERC-Rail (HK Branch) then introduced to the other side scientific research work being carried out in the centre.

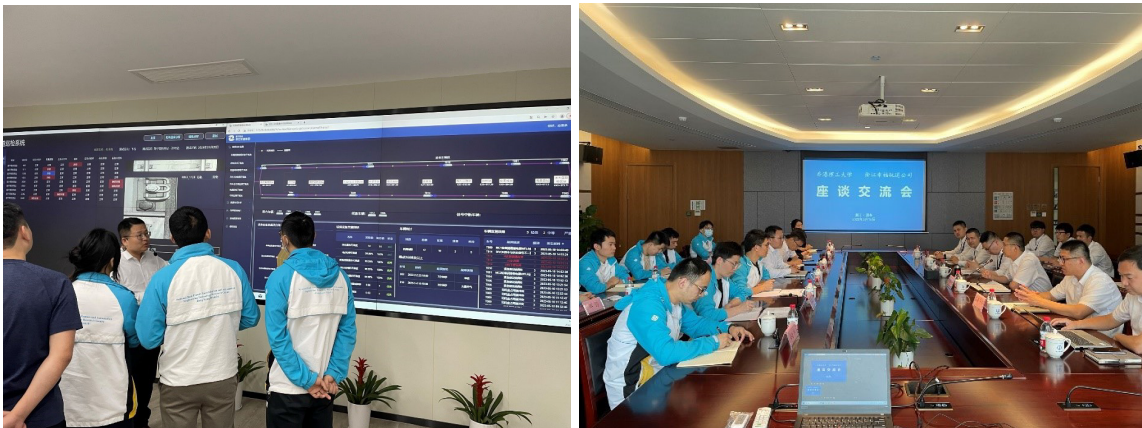


Fig. 3.31 Technical exchange between CNERC-Rail (HK Branch) and Zhejiang Rail Transit Operation and Management Group Co., Ltd (host)

3.3.6 Tongji University National Maglev Transportation Engineering Research Centre

On May 18, 2023, a delegation from the National Maglev Transportation Engineering Technology Research Centre of Tongji University visited CNERC-Rail (HK Branch) and gave a series of lectures on “High-speed Maglev Technology”. Prof. Xiao-Hong Chen, Prof. Jun-Qi Xu, and Dr. Hong-Liang Pan, Directors of the National Maglev Transportation Engineering Technology Research Centre, Mr. Li-Jun Rong and Dr. You-Gang Sun presented reports. Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), and many members of the centre attended the lectures. Thereafter, both parties held a fruitful meeting.



Fig. 3.32 CNERC-Rail (HK Branch) host technical exchange with National Maglev Transportation Engineering Research Centre of Tongji University

3.3.7 Zhejiang Communications Investment Group Co., Ltd.

On June 26, 2023, Mr. Zhi-Hong Yu, Chairman of Zhejiang Communications Investment Group Co., Ltd. (CICO), led a delegation to visited CNERC-Rail (HK Branch). Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), gave an overview of the research centre to the visitors, including the main research projects and achievements. Other members of the centre then introduced the latest outcomes of the centre's work such as the maglev test platform, the bogie rolling test platform, and the three-in-one composite sustainable energy harvester. The two parties had in-depth discussions on some engineering technologies and scientific research topics being undertaken by CNERC-Rail (HK Branch). Through this visit and exchange, CICO and CNERC-Rail (HK Branch) established a closer link and promoted future industry-university cooperation and talent development.





Fig. 3.33 CNERC-Rail (HK Branch) hosted a technical exchange with Zhejiang Communications Investment Group Co., Ltd.

3.3.8 Wuyi University

From November 2-4, 2023, Dr. Su-Mei Wang, Dr. Zheng-Wei Chen, Dr. Wen-Qiang Liu, Mr. Gao-Feng Jiang, Ms. Xin-Yue Xu and Mr. Guang-Zhi Zeng, members of CNERC-Rail (HK Branch), visited the School of Rail Transit of Wuyi University and exchange with scholars and experts in various R&D centres and laboratories. Prof. Xiao Meng, Dean of the School of Rail Transit at Wuyi University, introduced the research directions and topics of the School. Vice Dean, Prof. Zun-Di Huang, and Dr. Su-Mei Wang, further exchanged outcomes of key research projects being carried out by the two sides. Through this meeting, both sides reached a general consensus on strengthening talent training, academic exchanges, and research cooperation in the field of rail transit. After the meeting, members of CNERC-Rail (HK Branch) visited the Rail Transit Laboratory of Wuyi University exchanging thoughts and discussing potential achievement and application of sensors developed by the Flexible Sensing Materials and Devices Research and Development Centre in the field of rail transit. The two parties expressed a preliminary intention to cooperate in future R&D work. Members of CNERC-Rail (HK Branch) also visited the sensor laboratory of the R&D centre to learn new sensing techniques and preparation for experiments.



Fig. 3.34 Technical exchange at Wuyi University

3.3.9 School of Traffic and Transportation Engineering, Central South University

From 8th to 9th November, 2023, Prof. Yong Peng, Prof. Tang-Hong Liu, Prof. Dan Zhou, Prof. Xiang Liu, Dr. Wei Zhou, Dr. Lei Zhang, Dr. Ying-Li Li, Dr. Cheng-Xing Yang, and Dr. Xiao-Dong Chen, from the School of Traffic and Transportation Engineering of Central South University, visited CNERC-Rail (HK Branch) and the Industrial Centre of The Hong Kong Polytechnic University and gave a series of academic lectures on train aerodynamics, train operation comfort, train vibration and noise reduction, and special vehicle operation status monitoring. Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), and members of the centre attended the lectures and workshops. Thereafter, Dr. Zheng-Wei Chen, Dr. Su-Mei Wang, Dr. Wai-Kei Ao, Dr. E Deng and other members of the centre exchanged and discussed technical details relating to future research directions with the delegation from Central South University.



Fig. 3.35 CNERC-Rail (HK Branch) hosted a technical exchange with delegation from the High-speed Train Research Centre of Central South University

From 28th to 29th December, 2023, Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch) and Dr. Zheng-Wei Chen, visited the School of Traffic and Transportation Engineering and the School of Civil Engineering of Central South University. Prof. Yi-Qing Ni introduced the research direction and major research topics of CNERC-Rail (HK Branch) to the other side and gave a lecture titled “Scientific Machine Learning and its Engineering Application” followed then exchanging ideas with scholars and students. Prof. Yi-Qing Ni and Dr. Zheng-Wei Chen visited the rail vehicle collision control room and saw the tornado wind tunnel and other test equipment. He made some suggestions on making full use of the test technology to ensure safe operation of high-speed trains, and proposed new frontiers for cooperation with the School of Transportation Engineering of Central South University.



Fig. 3.36 Technical exchange activities at High-speed Train Research Centre of Central South University

3.3.10 School of Oceanography and Meteorology, Guangdong Ocean University

From 8th to 10th December, 2023, Dr. E Deng, Mr. Huan Yue and Mr. Xin-Yuan Liu, members of CNERC-Rail (HK Branch), visited Guangdong Ocean University to and met Prof. Jian-Jun Xu and Dr. Shi-Fei Tu of the School of Oceanography and Meteorology. Discussion mainly focused on “Potential risk assessment of landfalling typhoons and its disaster-causing mechanism”.



Fig. 3.37 Technical exchange activities at the School of Oceanography and Meteorology of Guangdong Ocean University

3.3.11 Shantou University

On December 18, 2023, Prof. Shang-Yu Hu and Dr. Si-Xin Chen from Shantou University visited CNERC-Rail (HK Branch) and met Prof. Yi-Qing Ni and other members of the centre including Dr. You-Wu Wang, Dr. Su-Mei Wang, and Dr. Zheng-Wei Chen. On January 3, 2024, Prof. Yi-Qing Ni visited Shantou University and gave a lecture entitled “Machine Learning Embedded in Physics and Its Application in Civil Engineering and Urban Disaster Mitigation”.

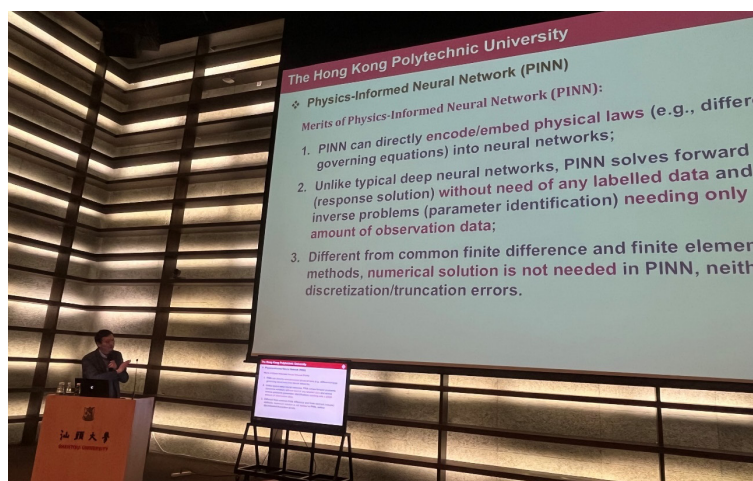


Fig. 3.38 Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), giving lecture at Shantou University

3.3.12 Other Technical Exchange Activities

Table 3.2 Summary of other technical exchange activities

No.	Date	Exchange with	Institute	Subject
1	2023-02-14	Department of Aeronautical and Aviation Engineering	The Hong Kong Polytechnic University	Application of robotic technology in civil infrastructure inspection
2	2023-03-02	Technician	Shenzhen Disaster Prevention and Reduction Research Institute and Zhongzhen Huachuang Company	Delegation advanced sensors and monitoring systems that provide early warning of earthquakes and other disasters
3	2023-05-25	Associate Prof. Fernando Moreu	University of New Mexico	Latest research results of the railway sub-centre

4	2023-06-09	Prof. Ahsan Kareem	University of Notre Dame	Modeling the Dynamics of Tall Buildings Under Winds: From Historical Perspective to Contemporary Advances and Beyond
5	2023-06-19	Prof. Ashraf El Damatty	University of Western Ontario, Canada	Advances in Structural Wind Engineering at the University of Western Ontario, Canada
6	2023-08-21	Prof. Bao-Guo Han	Dalian University of Technology	Nano-engineered concrete for sustainable infrastructure
7	2023-09-02	Technician	project committee	Sichuan-Tibet Railway Project
7	2023-09-22	Dr. Pak-Wai Chan	Hong Kong Observatory	Phased progress of the TRS project
8	2023-11-01	Prof. Xin-Bin Yang	Shenzhen Polytechnic University	High-speed rail monitoring platforms and maglev testing platforms
9	2023-11-28	Prof. Wei-Kang Jiang	Shanghai Jiao Tong University	Technology with Application of Noise Reduction for Urban Railway Transit
10	2023-11-30	Technician	Institute of Aerospace Information, Chinese Academy of Sciences AIRSAT Technology Company	Cooperation in satellite-related research and development

3.4 Organized Lectures

3.4.1 Lecture by Dr. Qi Zhao

On February 13, 2023, Dr. Qi Zhao, Assistant Professor from Department of Civil and Environmental Engineering, was invited to present to members of the CNERC-Rail (HK Branch). His research findings on deployment of film sensors on rail track monitoring. Dr. Zhao also introduced his research on Micro-CT technology. Our members and Dr. Qi Zhao took the opportunity to share ideas and to discuss further on subjects related to railway monitoring.



Fig. 3.39 Dr. Qi Zhao giving lecture

3.4.2 Lectures by Prof. Hai Guo and Prof. Alessandro Stocchino

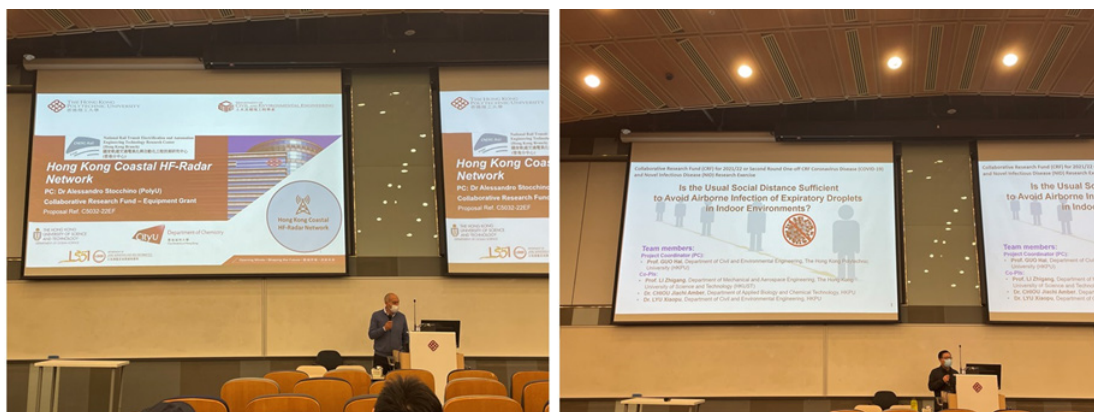


Fig. 3.40 Lectures delivered by Prof. Hai Guo and Prof. Alessandro Stocchino

On February 16, 2023, CNERC-Rail (HK Branch) invited Prof. Hai Guo and Prof. Alessandro Stocchino to deliver lectures on Collaboration Research Fund (CRF) projects. Prof. Hai Guo's lecture was entitled "Is the Usual Social Distance Sufficient to Avoid Airborne

Infection of Expiratory Droplets in Indoor Environments” and he made suggestions concerning virus transmission in rail transportation infrastructure spaces and within train carriages. Prof. Alessandro Stocchino spoke about Hong Kong coastal HF-radar network. Members of the CNERC-Rail (HK Branch) then discussed with two professors about possible future collaboration.

3.4.3 Lectures by scholars from National Maglev Transportation Engineering R&D Centre

A delegation from National Maglev Transportation Engineering R&D Centre visited CNERC-Rail (HK Branch) on May 18, 2023 and gave a lecture series on High-speed Maglev Technology. Speakers including Prof. Xiao-Hong Chen (Director of National Maglev Transportation Engineering R&D Centre), Prof. Jun-Qi Xu (Professor), Dr. Hong-Liang Pan, Mr Li-Jun Rong and Dr. You-Gang Sun (Associate Professor). Yi-Qing Ni, (Chair Professor, Director of CNERC-Rail (HK Branch)), and members of the centre attended the lectures. Both sides tkko the opportunity to discuss further cooperation.



Fig. 3.41 Prof. Yi-Qing Ni presenting appreciation certificates to speakers from National Maglev Transportation Engineering R&D Centre

3.4.4 Lecture by Professor Fernando Moreu

Prof. Fernando Moreu from the University of New Mexico visited CNERC-Rail (HK Branch) on May 25, 2023, and gave a lecture entitled “Human-Machine-Data Interfaces for Structural Health Monitoring of Critical Rail Infrastructure” to members of the centre.

Prof. Yi-Qing Ni (Chair Professor), Dr. Wai-Kei Ao (Research Assistant Professor), Dr. Su-Mei Wang (Research Assistant Professor), Dr. Zheng-Wei Chen (Research Assistant Professor), Mr Han-Zhang Lu and Mr Sheng-Yuan Liu showed Prof Fernando Moreu IC Corner, and introduced the latest research work of the centre. After the tour, a meeting was held to discuss further cooperation.

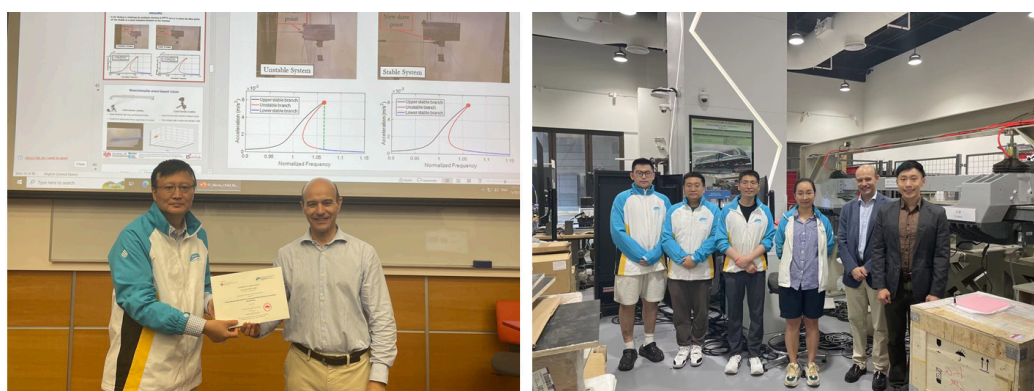


Fig. 3.42 Lecture by Professor Fernando Moreu

3.4.5 Lecture by Professor Ahsan Kareem

On June 9, 2023, Prof. Ahsan Kareem from the University of Notre Dame visited CNERC-Rail (HK Branch) to deliver a lecture entitled “Modeling the Dynamics of Tall Buildings Under Winds: From Historical Perspective to Recent Advances and Beyond”. Prof. Yi-Qing Ni (Director of CNERC-Rail (HK Branch)), Dr. You Dong (Associate Professor), Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), and other members of the centre, attended the lecture. Thereafter, Dr. Zheng-Wei Chen and Dr. E Deng (Postdoctoral Fellow) presented the latest research work on high-speed train aerodynamics being conducted by the centre and invited advice with Prof. Kareem.



Fig. 3.43 Lecture by Prof. Ahsan Kareem

3.4.6 Lecture by Professor Ashraf El Damatty

On June 19, 2023, Prof. Ashraf El Damatty from the University of Western Ontario in Canada visited CNERC-Rail (HK Branch) to deliver a lecture entitled “Advances in Structural Wind Engineering at the University of Western Ontario, Canada”. Prof. Yi-Qing Ni (Director of CNERC-Rail (HK Branch)), Dr. You-Wu Wang (Research Assistant Professor), Dr. Su-Mei Wang (Research Assistant Professor), Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), and other members of the centre, attended the lecture. Prof. Yi-Qing Ni then introduced the strategy and direction of development of the CNERC-Rail (HK Branch) to Prof. Damatty. Thereafter, Dr. You-Wu Wang, Dr. Zheng-Wei Chen, Dr. E Deng (Postdoctoral Fellow), and Dr. Chang-Chang Wang (Postdoctoral Fellow) presented the latest outcomes from research on structural health monitoring as well as high-speed train and building aerodynamics conducted by the centre and invited feedback from Prof. Damatty.



Fig. 3.44 Lecture by Prof. Ashraf El Damatty

3.4.7 Lecture by Professor Bao-Guo Han

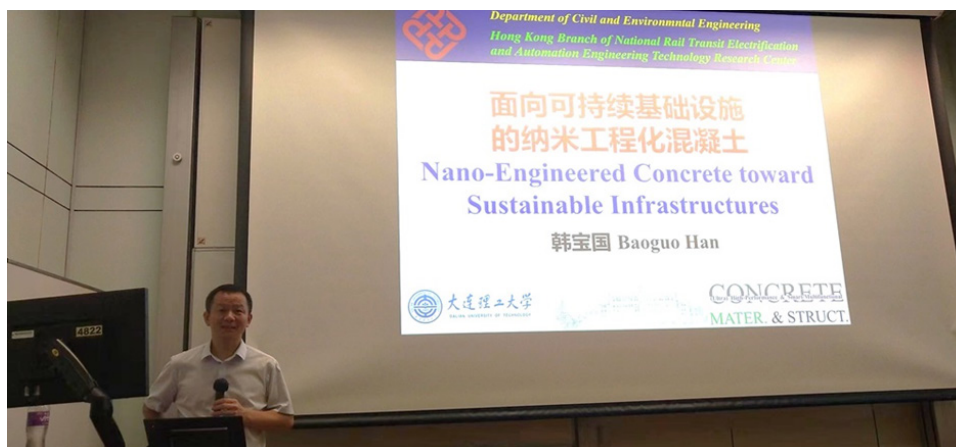


Fig. 3.45 Lecture by Prof. Bao-Guo Han

On August 21, 2023, Prof. Bao-Guo Han from Dalian University of Technology visited CNERC-Rail (HK Branch) to deliver a lecture entitled “Nano-engineered concrete for sustainable infrastructure”. Prof. Bao-Guo Han focused on sharing insights gained on the expansion of nanoengineered concrete properties and the validation of civil, transport, municipal and marine infrastructure applications. Prof. Yi-Qing Ni (Director of CNERC-Rail (HK Branch)), Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), and other members of the centre, attended the lecture. After the lecture, Dr. Mohammad and Dr. Gao-Feng Jiang from the centre had a fruitful discussion with Prof. Han on some of the interesting technical details.

3.4.8 Lecture by Professor Xue-Song Jin and his team

On September 5-7, 2023, Prof. Xue-Song Jin and his team members from Southwest Jiaotong University visited CNERC-Rail (HK Branch) and delivered several lectures on research work related to the control of wear and rail of high-speed railways in China. Prof. Yi-Qing Ni (Director of CNERC-Rail (HK Branch)), Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), Dr. Su-Mei Wang (Research Assistant Professor), Dr. You-Wu Wang (Research Assistant Professor), Dr. Hong-Wei Li (Research Assistant Professor) and other members of the centre, attended the lectures. In the subsequent meeting, Prof. Yi-Qing Ni, Dr. Zheng-Wei Chen and others discussed with Prof. Xue-Song Jin’s team more technical details and exchanged thoughts on future research directions.



Fig. 3.46 Lectures by Prof. Xue-Song Jin's team

3.4.9 Lecture by Prof. Billie F. Spencer

On October 8, 2023, Prof. Billie F. Spencer, the Nathan M. and Anne M. Newmark Endowed Chair in Civil Engineering at the University of Illinois Urbana-Champaign, visited CNERC-Rail (HK Branch) to deliver a lecture entitled “Rapid Post-earthquake Structural Inspection and Evaluation of Civil Infrastructure”. Prof. Spencer presented two recently proposed approaches for automated rapid post-earthquake safety assessment. The first approach employs sparse acceleration measurements to define damage-sensitive features that can be used to infer the condition of buildings. Subsequently, a comprehensive strategy for rapid post-earthquake inspection and evaluation is formulated using images collected by commercial unmanned aerial vehicles (UAVs). Prof. Yi-Qing Ni, director of CNERC-Rail (HK Branch) and other members of the centre warmly welcomed Prof. Spencer in. In a personal meeting, more technical details and future research directions were discussed.



Fig. 3.47 Lecture by Prof. B.F. Spencer

3.4.10 Lectures by Distinguished Scholars from Central South University

On November 8-9, 2023, Prof. Yong Peng, Prof. Tang-Hong Liu, Prof. Dan Zhou, Prof. Xiang Liu, Dr. Wei Zhou (Associate Professor), Dr. Lei Zhang (Associate Professor), Dr. Ying-

Li Li (Associate Professor), Dr. Cheng-Xing Yang, and Dr. Xiao-Dong Chen from Central South University visited CNERC-Rail (HK Branch) and delivered a series of lectures related to train aerodynamics, train operation comfort, train vibration and noise reduction, as well as special vehicle operation state monitoring.

Prof. Yi-Qing Ni (Director of CNERC-Rail (HK Branch)), Dr. You Dong (Associate Professor), Dr. Kai Zhou (Assistant Professor), Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), Dr. Su-Mei Wang (Research Assistant Professor), Dr. You-Wu Wang (Research Assistant Professor), Dr. Hong-Wei Li (Research Assistant Professor) and other members of the centre, attended the lectures. The two sides further exchanged more technical information and discussion future at a meeting.



Fig. 3.48 Lectures by Scholars from Central South University

3.4.11 Lecture by Professor Wei-Kang Jiang

On November 28, 2023, Prof. Wei-Kang Jiang from Shanghai Jiao Tong University visited CNERC-Rail (HK Branch). He made a presentation entitled “Application of Noise Reduction Technology for Urban Railway Transit.” The presentation focused on research and development of urban rail transit noise measurement and assessment, wheel-rail noise reduction, and urban rail transit noise control facilities such as noise barriers. The topics included noise sources and propagation characteristics, noise reduction for elevated and underground rail transit, the effectiveness and limitations of existing noise reduction technologies, and prospects for future generating of technology for urban rail transit noise reduction. Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), and other centre members attended the presentation, and joined discussion on various technical details of the presented technologies.

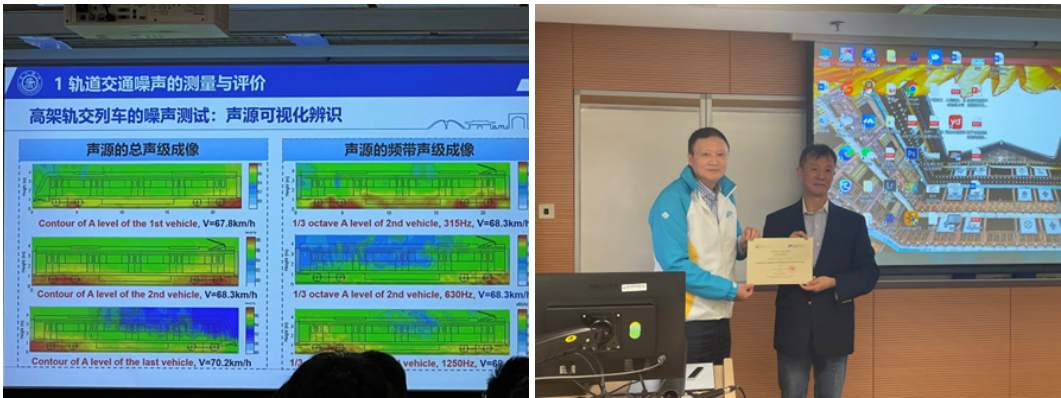


Fig. 3.49 Lecture by Prof. Wei-Kang Jiang

3.4.12 Other Lectures by External Speakers

Table 3.3 Other CNERC-Rail (HK Branch) Lecture

Time	Title	Presenter
2023-01-05	Liquid Metal Filled Magnetorheological Elastomers and Applications	Prof. Weihua Li, University of Wollongong
2023-04-26	Flow around trains and its effect on onboard train air quality	Prof. Hassan Hemida, University of Birmingham
2023-04-29	Safety and Risk Analysis of U.S. Freight Railroads	Prof. Xiang Liu, Rotgers University
2023-08-14	Intelligent and Resilient Transportation Infrastructure Management – Data Analytics and Decision Support	Dr. Yun Bai, The Hong Kong University of Science and Technology (Guangzhou)
2023-12-13	Enhancing Risk Management and Mitigation for Critical Civil Infrastructures through Advanced Monitoring, Inspection, and Control	Prof. Jian Li, University of Kansas

3.5 Visiting Scholars & Delegations

3.5.1 Hong Kong Trade Development Council

On January 18, 2023, Ms. Margaret Fong (Executive Director), Mr. Stephen Liang (Assistant Executive Director, Industry Promotion), Ms. Anna Cheung (Director, Service Promotion), Ms. Smilely Lam (Director, Merchandise Trade & Promotion), Mr. Eddie Lee (Associate Director, Merchandise Trade & Promotion), Mr. Bradford Lee (Associate Director, Merchandise Trade & Promotion) from HKTDC visited the CNERC-Rail (HK Branch) (Fig. 3.50). Dr. Wai-Kei Ao (Research Assistant Professor), Dr. You-Wu Wang (Research Assistant Professor), Dr. E Deng (Postdoctoral Fellow), Ms. Jia-Mei Wang, Mr. Bo-Yang Su and Mr. Tai-Tung Wai warmly welcomed the delegation and introduced the main research projects and interests as well as major research facilities at the centre.



Fig. 3.50 Delegation from Hong Kong Trade Development Council (HKTDC)

3.5.2 Chief Engineer (Railways) of the Electrical and Mechanical Services Department, HKSAR

On January 30, 2023, Mr. Chan, Asst Director (Railways) and Mr. Cheong, Chief Engineer (Railways) of the Electrical and Mechanical Services Department (EMSD), HKSAR, visited the CNERC-Rail (HK Branch) (Fig. 3.51). Dr. Siu-Kai Lai (Associate Professor), Dr. Qi Zhao (Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), Dr. Kenneth Lai (Scientific officer), Dr. Wen-Qiang Liu (Postdoctoral Fellow), Ms. Jia-Mei Wang, Mr. Bo-Yang Su and Mr. Tai-Tung Wai warmly welcomed Mr Chan and Mr Cheong. Representatives from CNERC-Rail (HK Branch) introduced the advanced maglev experimental platform, innovative research work, great achievements, and major research facilities to the visitors.



Fig. 3.51 Chief Engineer (Railways) of the EMSD, HKSAR visiting the centre

3.5.3 Shenzhen Academy of Disaster Prevention and Reduction

On March 9, 2023, Mr Jian-Tao Huang (Senior engineer (full researcher level), Dean), Dr. Li-Xin Wang (Senior engineer (full researcher level), Assistant Dean), Dr. Jian-Fu Lin (Associate Research Fellow, Deputy Director of Research Centre) from the ADPR visited the CNERC-Rail (HK Branch) (Fig. 3.52). Prof. Yi-Qing Ni (Director of the Branch) and members of the branch warmly welcomed the visitors. At the meeting of both parties, ADPR expressed great interest in the research work of the CNERC-Rail (HK Branch) and their wishes to strengthen exchange and cooperation.



Fig. 3.52 Delegation from Shenzhen Academy of Disaster Prevention and Reduction

3.5.4 Changchun Railway Vehicles Co., Ltd.

On March 14, 2023, Mr. Xue-Xin Li (Site Manager, After-sale Department International Business Division) and Mr. Tie-Zhu Wang (Assistant) from the CRRC visited the CNERC-

Rail (HK Branch) (Fig. 3.53). Prof. Yi-Qing Ni (Director of the Branch), Dr. Su-Mei Wang (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), Dr. You-Wu Wang (Research Assistant Professor), Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. E Deng welcomed and accompanied the visitors in the tour around CNERC-Rail (HK Branch) IC Corner. Members of the CNERC-Rail (HK Branch) introduced the latest research work of the centre and discuss with the delegation about further cooperation.



Fig. 3.53 Delegation from Changchun Railway Vehicles Co., Ltd.

3.5.5 Hangzhou Delegation

On June 27, 2023, a delegation from Hangzhou visited to the CNERC-Rail (HK Branch) (Fig. 3.54). As advised by the Hangzhou Bureau of Science and Technology, the Hangzhou municipal government is planning to set up a “Hangzhou Innovation Incubation Centre” in Hong Kong and to establish a cross-border technology transfer fund to help promoting synergistic advancement of science and technology development in Hong Kong and Hangzhou. Dr. You-Wu Wang, Research Assistant Professor of Civil and Environmental Engineering at CNERC-Rail (HK Branch), gave a comprehensive introduction about the research centre to the Hangzhou delegation. The Hangzhou delegation expressed great admiration to the remarkable research achievements of CNERC-Rail (HK Branch) and looked forward to greater opportunity for further collaboration created through this visit.



Fig. 3.54 Hangzhou Delegation

3.5.6 Zhejiang Rail Transit Operation Management Group Co., Ltd.

On June 28, 2023, a delegation from Zhejiang, composing Mr. Hua Chen, Chairman of CICO; Mr. Hong-Bo Su, Chief Intelligence Officer; Mr. Hui-Qiang Mo, Deputy General Manager of Zhejiang Haining Railway Transportation Operation Management Company Limited, Mr. Geng-Guang Xue, Deputy General Manager of Shanghai Shenzhe Digital Intelligence Railway Technology Company Limited, and Dr. Dong Zou, Head of the Post-doctoral Unit, visited the CNERC-Rail (HK Branch) (Fig. 3.55). The delegation was received by Prof. Yi-Qing Ni, Director of the CNERC-Rail (HK Branch), Dr. Siu-Kai Lai, Associate Professor of Department of Civil and Environmental Engineering (CEE), Dr. You Dong, Associate Professor of CEE and other members of the centre. At the meeting, the two sides exchanged information of the work of CNERC-Rail (HK Branch) crew in the previous technical visit to the rail transit in May. Chairman Hua Chen pointed out that there were deficiencies in the overall system of intelligent operation and maintenance and remarked that cooperation between CNERC-Rail (HK Branch) and a subsidiary company of his group could build a practical and high-level operation and maintenance system, supporting the development of the company in the rail transportation field through advanced scientific research.



Fig. 3.55 Delegation from Zhejiang Rail Transit Operation Management Group Co., Ltd.

3.5.7 National Institute for Urban Safety and Development Science and Technology and Beijing University of Science and Technology Urbanization and Urban Safety Research Institute

On July 5, 2023, delegations from the National Institute for Urban Safety and Development Science and Technology led by Academician Qing-Rui Yue, together with a delegation from the Beijing University of Science and Technology Urbanization and Urban Safety Research Institute, visited the CNERC-Rail (HK Branch) (Fig. 3.56). Prof. Yi-Qing Ni, Director of the CNERC-Rail (HK Branch), together with other key members, warmly welcomed the visitors and introduced the centre's research facilities and the latest research work. The delegation highly praised the scientific achievements made by the centre and actively explored future potential for collaboration.



Fig. 3.56 Delegation from National Institute for Urban Safety and Development Science and Technology and Beijing University of Science and Technology Urbanization and Urban Safety Research Institute

3.5.8 Dongguan City Deputy Party Secretary and Songshan Lake Party Working Committee Secretary

On August 25, 2023, a delegation led by Mr. Wei Liu, Deputy Party Secretary of Dongguan City and Party Working Committee Secretary of Songshan Lake, visited the CNERC-Rail (HK Branch) (Fig. 3.57). Prof. Yi-Qing Ni, Director of the CNERC-Rail (HK Branch), and other key members warmly welcomed the visitors and introduced the centre's research facilities within the Industrial Centre and the latest research work. The delegation highly praised the scientific achievements made by the centre and actively discussed possible directions for collaboration.



Fig. 3.57 Delegation led by Dongguan City Deputy Party Secretary and Songshan Lake Party Working Committee Secretary (Mr. Wei Liu)

3.5.9 China Railway Construction Co., Ltd.

On August 29, 2023, Mr. Hong-Ping Zhang, Mr. Ying Xiong and Mr. Jian Chen from China Railway Construction Corporation Limited visited the CNERC-Rail (HK Branch) (Fig. 3.58). Dr. Zheng-Wei Chen (Research Assistant Professor), Dr. Wai-Kei Ao (Research Assistant Professor), Dr. Su-Mei Wang (Research Assistant Professor), Dr. You-Wu Wang (Research Assistant Professor), Dr. Hong-Wei Li (Research Assistant Professor) and other members of the centre, warmly welcomed the visitors, Dr. Zheng-Wei Chen gave an overview of CNERC-Rail (HK Branch), followed by Dr. Wai-Kei Ao introducing the cooperation with MTR, and Dr. You-Wu Wang introducing the Hangzhou Research Institute.

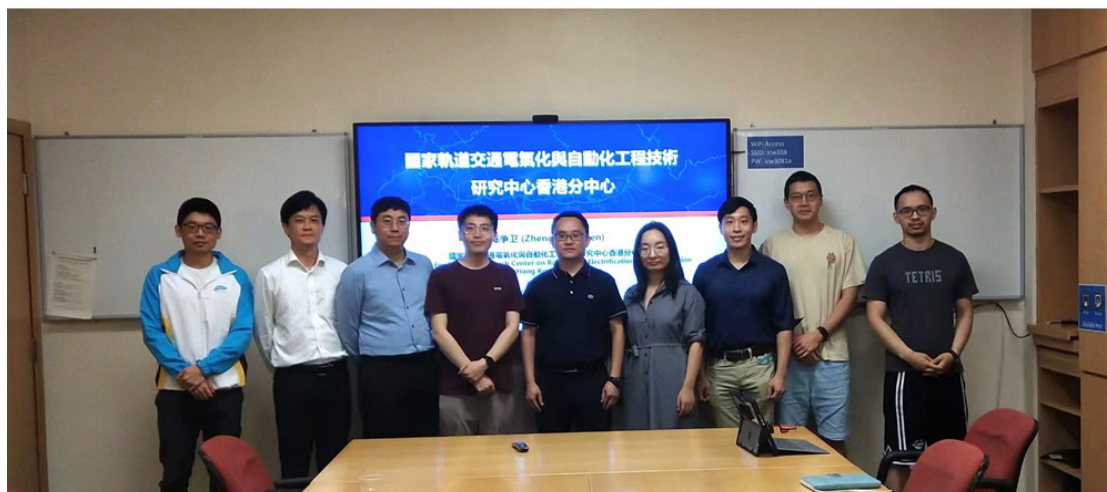


Fig. 3.58 Delegation from China Railway Construction Co., Ltd.

3.5.10 National Natural Science Foundation of China

On October 24, 2023, a delegation from the National Natural Science Foundation of China visited the CNERC-Rail (HK Branch) (Fig. 3.59). Dr. Su-Mei Wang (Research Assistant Professor), together with other key centre members, warmly welcomed the visitors and introduced the centre's research facilities and the latest research work.

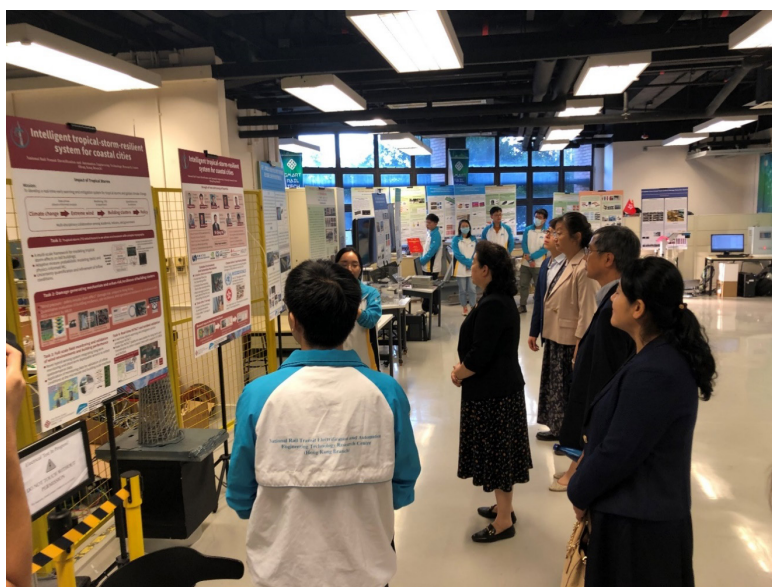


Fig. 3.59 Delegation from National Natural Science Foundation of China

3.5.11 Ministry of Science and Technology of China, Guangdong-Hong Kong-Macao Greater Bay Area National Technology Innovation Centre, and Hong Kong Innovation and Technology Department

On November 16, 2023, Mr. Hong-Sheng Chen, Mr. Jun Fan, and Mr. Bo-Wen Shen from the Ministry of Science and Technology (Department of Science and Technology Achievement

Transformation and Regional Innovation); Ms. Ying Zhu and Mr. Jing Liu from the Guangdong-Hong Kong-Macao Greater Bay Area National Technology Innovation Centre, together with Mr. Man-Wai Lu and Mr. Lai-Yin Leung from the Hong Kong Innovation and Technology Department, visited the CNERC-Rail (HK Branch) (Fig. 3.60). The research group was warmly welcomed by Prof. Yi-Qing Ni, Director of the CNERC-Rail (HK Branch), Dr. Zheng-Wei Chen, and Dr. Hong-Wei Li. Prof. Ni showcased the centre's significant progress and achievements, earning unanimous praise and affirmation from the officials/experts. The experts all hoped that the CNERC-Rail (HK Branch) would continue to contribute to strengthening the national innovation ecosystem.



Fig. 3.60 Delegation from Ministry of Science and Technology of China, Guangdong-Hong Kong-Macao Greater Bay Area National Technology Innovation Centre, and Hong Kong ITC

3.5.12 Hong Kong and Macao Work Office of the CPC Central Committee

On November 28, 2023, a delegation from the Fourth Bureau of the Hong Kong and Macao Work Office of the CPC Central Committee visited the CNERC-Rail (HK Branch) (Fig. 3.61). Prof. Yi-Qing Ni, Director of the CNERC-Rail (HK Branch), warmly welcomed the delegation and introduced the centre's research facilities and the latest research work. The research achievements were highly praised by the officials of the Central People's Government Liaison Office in the Hong Kong SAR.



Fig. 3.61 Delegation from Fourth Bureau of the Hong Kong and Macao Work Office of the CPC Central Committee

3.5.13 Other Visiting Scholars & Delegations

Table 3.4 Other visiting scholars & delegations

No.	Date	Visiting Scholars & Delegations
1	2023-01-10	Mr. Cheng-Yang Huang, a member of Professor Francesco Lanza di Scalea's Team from the University of California, San Diego
2	2023-03-02	Zhejiang Provincial Transportation Investment Group
3	2023-03-21	Wuyi University Delegation
4	2023-03-28	Beijing Hongsheng Shidai Technology Development Co., Ltd., General Manager Mr. Qing-Jun Zhu
5	2023-04-04	University of Illinois at Chicago, Prof. Farhad Ansari and University College London, Prof. Julia Stegemann
6	2023-04-24	Shenzhen Eborail Technology Co., Ltd.
7	2023-04-29	Rutgers University USA, Professor Xiang Liu
8	2023-05-08	Sanmen County Minister Jun-Jie Chen and Delegation
9	2023-05-17	Shanghai University of Engineering Science, Professor Xiao-Zhen Sheng
10	2023-05-18	Tongji University, National Maglev Transportation Engineering Technology Research Centre
11	2023-05-23	Qingdao Municipal Party Committee Organization Department
12	2023-05-25	University of New Mexico, Associate Professor Fernando Moreu

13	2023-06-05	Hong Kong Laureate Forum Media
14	2023-06-09	Academician Qing-Rui Yue & Shenzhen Urban Safety Institute
15		University of Notre Dame, Professor Ahsan Kareem
16	2023-06-12	Pennsylvania State University, USA, Assistant Professor Hai Huang
17	2023-06-16	National Engineering Research Centre for Dredging Technology and Equipment
18	2023-06-19	University of Western Ontario, Canada, Professor Ashraf El Damatty
19	2023-06-20	HKTDC Delegation
20	2023-06-29	Liaison Office of the Central People's Government in the Hong Kong SAR
21	2023-07-10	Beijing Institute of Technology Future Precision Engineering College faculty and students
22	2023-07-11	Southwest Jiaotong University, Professor Xue-Song Jin
23	2023-07-18	Luqiao District United Front Department of Taizhou City
24	2023-08-07	Central South University Delegation
25	2023-08-08	Zhejiang University Delegation
26	2023-08-17	Shenzhen Metro Delegation
27	2023-08-21	Dalian University of Technology, Professor Bao-Guo Han
28	2023-08-28	China Railway Construction Corporation Second Construction Co., Ltd. Chairman and Qingdao Branch Party Secretary of the Second Company
29	2023-09-04	Southwest Jiaotong University Professor Xue-Song Jin's Team
30	2023-09-22	Rotary Club of Metropolitan Hong Kong
31	2023-09-25	Wuyi University, Party Secretary Luan Tiangang and Deputy Party Secretary
32	2023-10-08	University of Illinois at Urbana-Champaign, Professor B.F. Spencer
33	2023-10-17	Zhejiang University, School of Mechanical Engineering, Professor Xin Li
34	2023-10-20	Hong Kong Polytechnic University School of Construction and Environment Distinguished Alumni Award Recipient
35	2023-11-01	Shenzhen Polytechnic University, Party Secretary Xin-Bin Yang -led Delegation
36	2023-11-03	Hong Kong Innovation and Technology Commission
37	2023-11-09	Central South University, Rail Transit Safety Ministry of Education Key Laboratory Team, led by Professor Xi-Feng Liang

38	2023-11-17	Deputy Secretary-General of the Ministry of Science and Technology of China, Mr. De-Fang He - led Delegation
39	2023-11-28	Beijing Normal University, National Security and Emergency Management College, Urban Safety Research Team
40		Yunnan Province Affiliated High School Teachers and Students Exchange Group
41		Shanghai Jiao Tong University, Professor Wei-Kang Jiang
42	2023-11-29	Zhejiang University Party Deputy Secretary and Vice-Chancellor
43	2023-11-30	Chinese Academy of Sciences Aerospace Information Innovation Research Institute with AIRSAT Technology Group Co., Ltd
44	2023-11-30	Academician Yun-Min Chen
45	2023-12-06	Shenzhen Futian District Deputy District Chief Zhu Jiang
46	2023-12-07	Harbin Institute of Technology President Academician Jie-Cai Han -led delegation
47	2023-12-09	University of Science and Technology of China, President Academician Xin-He Bao
48	2023-12-11	Beijing Institute of Technology Delegation
49	2023-12-13	University of Kansas, USA, Associate Professor Jian Li
50	2023-12-16	Beijing Jiaotong University Delegation
51	2023-12-18	Shantou University, Professor Shang-Yu Hu and Dr. Si-Xin Chen
52		Shanghai Jiao Tong University, School of Architecture, Associate Professor Dai-Yi Lai

3.6 Media Interviews

3.6.1 Radio Television Hong Kong Interview

In September 2023, the CNERC-Rail (HK Branch) was invited by Radio Television Hong Kong to participate in the filming of the program "I&T New Era". The program consisted of 22 episodes, introducing the research work and achievements of 16 scientists (State Key Laboratories (SKLs) and six scholars in Hong Kong branches of National Engineering Research Centres (CNERCs)). Video interviews outlined how these research outcomes would improve people's daily lives, thereby enhancing public understanding of related science and technologies. Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), participated in the interview making presentation on behalf of the Centre (Fig. 3.62). The episode of CNERC-Rail (HK Branch) will be broadcast on RTHK 31 at 20:25 in March/April 2024. After the premiere date, each episode will be broadcast repeatedly on RTHK 31 and 32. The clip will be uploaded to RTHK's Facebook page and YouTube channel.

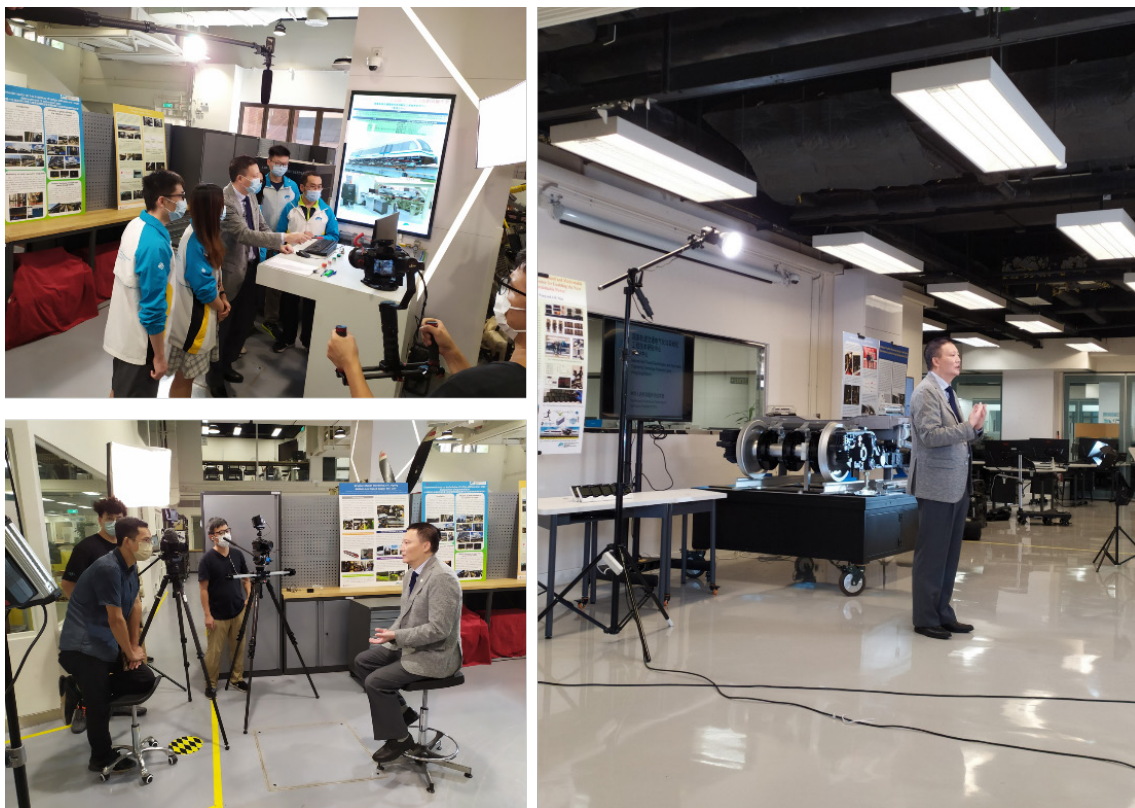


Fig. 3.62 Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), participating in the filming of TV program of Radio Television Hong Kong

3.6.2 Anhui Science and Technology News Interview

To respond to the latest national strategic plan, to comprehensively enhance the two-way exchanges in education, science and technology, and talents between Hong Kong and Hefei, and to promote intensive and effective cooperation between the Hong Kong Polytechnic University and the universities and research institutes in Hefei, new R&D institutions, and relevant chain enterprises in the industry-university-research cooperation, the Hong Kong Polytechnic University Exchange and Cooperation Symposium was held at Shangri-La Hotel in Hefei On October 26, 2023. Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), was interviewed by Anhui Science and Technology News (Fig. 3.63). Prof. Yi-Qing Ni outlined key research areas including advanced sensing technology, intelligent vibration control, energy harvesting, machine learning and big data analysis in the communication introduction of “Sensing Technology Sharing”.



Fig. 3.63 Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), being interviewed by Anhui Science and Technology News

3.6.3 Hangzhou Daily Interview

On November 7, 2023, The Hong Kong Polytechnic University’s Hangzhou Institute of Technology Innovation Research was formally established and inaugurated. Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), was interviewed by Hangzhou Daily (Fig. 3.64). The

Institute of Technology Innovation was jointly established by the Hong Kong Polytechnic University and Gongshu District. It consists of three research centres, namely, the Centre for Railway Transportation Intelligence, the Centre for Digital Intelligence Medical and Aesthetic Research, and the Centre for Grand Canal Culture and Tourism Research. The Railway Transportation Intelligence Centre is located at Tcar Hangzhou Automobile Culture Theme Park at Shen Half Road in Gongshu District, making use of the plant in the theme park to establish a simulation laboratory to carry out research and experiments on advanced sensors for rail transportation, all-round solutions for vibration and noise reduction in rail transportation, and intelligent operation and maintenance technologies for rail transportation. “The Hong Kong MTR Corporation is the only profitable metro company in the world, and many people come to Hong Kong to learn relevant experience and technology. The research centre will provide strong technical support for the establishment of a first-class intelligent rail transit system, and for upgrading the intelligence of existing rail transit operation and maintenance.” Prof. Yi-Qing Ni said, “For example, our research work on intelligent operation and maintenance technology for rail transit aims at using sensors to conduct automatic on-line examination of trains in operation without the need to go to special yards for inspection and maintenance, thereby significantly reducing the cost of maintenance. Later, advanced products developed from our research work will be sold to worldwide with Hangzhou Gongshu as the centre. The research centre has already started recruiting software engineers in Hangzhou.”



Fig. 3.64 Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), being interviewed by Hangzhou Daily.

3.6.4 Hong Kong Wen Wei Po Interview

Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), was interviewed by Hong Kong Wen Wei Po in December 2023 (Fig. 3.65). The newspaper made a series of reports to outline how Hong Kong researchers combine innovative R&D and advanced technology engineering to combat fire, wind, water and earth borne disasters, and guard the public with the use of science. In order to cope with the threat received from extreme storms in complex urban environments, the team led by Prof. Yi-Qing Ni had received nearly HK\$50 million funding from the RGC this year to develop a real-time urban typhoon risk warning and management system, “INTACT”, to address the problem of typhoon resistance of high-rise buildings in coastal cities. In an interview with Hong Kong Wen Wei Po, Prof. Yi-Qing Ni shared that the project would design a framework that could effectively and accurately assess turbulence and quantify the risks caused by complex urban aerodynamics through sparse measurements, as well as quantitatively assess the resilience of the city, so as to more comprehensively anticipate the potential risks and consequences of windstorms on critical buildings, and to prevent them from occurring in the first place.

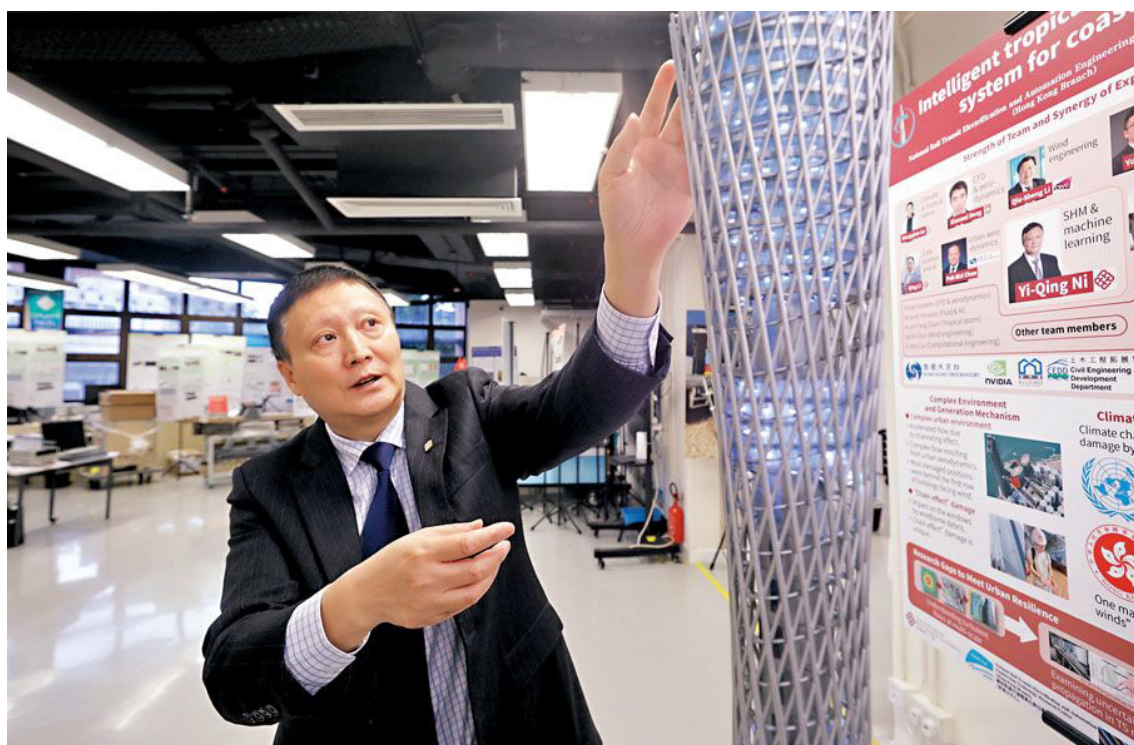


Fig. 3.65 Prof. Yi-Qing Ni, Director of CNERC-Rail (HK Branch), being interviewed by Hong Kong Wen Wei Po

3.6.5 Radio Television Hong Kong Show “Hong Kong Stories - Inventors in Hong Kong”

On August 29, 2023, Prof. Ka-Wai Cheng, Director of PERC, shared his devotion to building his dream car in “Hong Kong Stories - Inventors in Hong Kong: Father of Hong Kong Electric Vehicles” (Fig. 3.66). As early as 2005, he led his research team in the development of a fully electric vehicle, making Hong Kong one of the pioneering place worldwide in the development of electric vehicle technology. Since childhood, Prof. Ka-Wai Cheng has had a penchant for disassembling and reassembling objects, which fueled his aspiration to become an engineer when he grew up. He finds great joy in transforming his interests into his life's work. Prof. Ka-Wai Cheng envisions a future where electric vehicles can undergo transformations akin to the robots in the movie “Transformers” allowing cars to alter their size and shape at will, or even merge two vehicles into one. For many years, he has dedicated his research efforts to exploring technologies that bring him closer to realizing this dream.



Fig. 3.66 Prof. Ka-Wai Cheng, Director of PERC, appearing on RTHK program

3.6.6 Zhuzhou News Network Interview

On July 28, 2023, Dr. Zheng-Wei Chen, Research Assistant Professor of CNERC-Rail (HK Branch), together with Dr. Wen-Qiang Liu, Postdoctoral Fellow, and Dr. E Deng, Postdoctoral Fellow, visited the Power Valley Exhibition Centre in Tianyuan District, Zhuzhou, the Power Valley Autonomous Innovation Park, the Profiles Branch of Zhuzhou Cemented Carbide Group Company Limited, and the CSR Zhuzhou Electric Locomotive Research

Institute Co. Ltd. Dr. Zheng-Wei Chen and Dr. E Deng were interviewed by Zhuzhou News Network (Fig. 3.67). The program also introduced in detail the industrial layout and development of advanced manufacturing industry in Zhuzhou. Dr. Zheng-Wei Chen and Dr. E Deng remarked in the interview video that they were looking forward to further promotion of exchanges between Hong Kong and Zhuzhou rail manufacturing in the future, enhancement in mutual cooperation between two sides and advancement in science and technology in both sides.



Fig. 3.67 Dr. Zheng-Wei Chen and Dr. E Deng being interviewed by Zhuzhou News Network

Appendix

A.1 Equipment Purchased

A.2 News Reports



Appendix

A.1 Equipment Purchased

No.	Device/Sensor	Quantity
1	Fast-response Wind Velocity Measurement System	1
2	Maglev Train Wind Tunnel Model	1
3	Objective Lens EC Epiplan-Neofluar 100x/0.9 BD DIC M27	1
4	Linear Power Amplifier with Cooling Fan and Spare Parts for Existing B&K LDS V406 Shaker	1
5	Vibration Sensors, Data Loggers, Ultrasonic Anemometer, Surveillance Camera and Beidou Displacement Monitoring System	1
6	DEXINMAG DX-360 Gauss Meter	1
7	GML2001 Magnetic Levitation Experiment System	1
8	ATI Six-axis Force/ Torque Sensor	1
9	Mass Flow Controllers System	1
10	Rail Inspection Trolley System	1
11	DYTRAN 3263A2 Tri-axial Accelerometer	5
12	FC-M Balanced Fiber-optic Receiver	1
13	Keysight Digital Oscilloscope-function Waveform Generators-oscilloscope Software	1
14	Optical Spectrometer HF-9332	1
15	Bruel & Kjaer 2692-A-0S1 Single Channel Charge Conditioning Amplifier	1
16	Railway Track Bolts and Nuts Alignment Checking System	1
17	Railway Track Model with Hanger	1
18	Maglev Track Inspection Vehicle with 3D Cameras for Track Alignment Inspection	1
19	Maglev F-type Rail for Detection of Loose Bolts and Nuts	1
20	Maglev Monitoring Platform	1
21	Advanced Active Vibration Control System	1
22	DEWESOFT SIRIUS-2xMULTI 2 Channel Differential Sirius Slice	1
23	DEWESOFT-OPT-FG-MUL Multichannel Function Generator	1

24	System Controller	1
25	DEWESOFT DSI-ACC DSI Adapter for IEPE Sensors	1
26	LUNA/ os7220 (sensor A)	3
27	LUNA/ os7230 (sensor B)	3
28	LUNA/ os7510 (sensor C)	3
29	1189-PK-020 Power & Communications Interface (PCIA)	1
30	Magnetic Levitation System Model: GML1001	1
31	LUNA si255 High Speed Fibre Optical Interrogator	1
32	Track Inspection Vehicle Cameras	1
33	Lus Discovery Laser-ultrasonic Detection Unit	1
34	CMOS Laser sensor Item: IL-100	1
35	CMOS Laser Sensor Item: IL-1000	1
36	Ultrasonic Transducer	1
37	Charge Amplifier	1

A.2 News Reports



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学会动态	聚焦县区	视频动态	科技教育	三农科技	科技致富	理论	法制在线	智慧医疗	健康生活

地方频道: 合肥 淮北 亳州 宿州 蚌埠 阜阳 淮南 滁州 六安 马鞍山 芜湖 宣城 铜陵 池州 安庆 黄山

当前位置: 首页 > 各地动态 > 合肥

香港理工大学交流合作座谈会在合肥召开

来源: 安徽科技报 责编: 王雨君 发布: 2023-10-31 17:10:35



A⁻ A⁺

为积极响应国家战略部署, 全面深化香港和合肥两地教育、科技、人才等方面双向交流, 促进香港理工大学与在肥高校科研院所、新型研发机构、相关产业链企业开展深度有效的产学研合作, 10月26日, 香港理工大学交流合作座谈会在合肥香格里拉酒店召开。



合肥市庐阳区人民政府副区长康震纪、合肥市庐阳区科技局局长王俊、合肥市科技局平台处负责人孙民裕, 香港理工大学副校长赵汝恒、协理副校长董澄等相关负责同志, 以及高校科研院所、企业代表共同出席会议。会议由康震纪主持。



会议伊始, 赵汝恒致辞并对香港理工大学作简要介绍。他表示, 香港理工大学一直强调教育、科研及知识转移应以贡献社会为目标、积极鼓励港理大社群将科研成果转化为实际应用、造福社会。并指出, 希望通过与庐阳区合作共建技术创新研究院, 共同推动科研发展, 促进科研成果就地转化、孵化, 实现科研成果转化与产业化可持续发展, 力争在生物医药、精密传感技术和航天信息等领域, 打造国内一流、国际高端的战略科技创新平台, 实现互利共赢。

其后, 香港理工大学土地测量及地理信息系主任、教授陈武, 航空与民航工程系助理教授黄海龙, 土木及环境工程学系讲座教授倪一清等学校相关负责同志分别作合作交流介绍。

陈武教授以“空天信息技术及应用”为主题, 详细讲解了基于北斗导航卫星系统的无缝韧性技术和服务、智慧城市的应用、深空探测技术等三个方面内容。他表示, 北斗定位技术的一个重要研究方向是如何减少各类误差, 卫星信号通过介质的变化, 可以反映介质的特征。

黄海龙博士的项目分享, 介绍了电动垂直起降飞行器、低轨卫星支持民航客机无线通讯、具身智能等内容, 重点论述了无人机的设计、感知、规划和控制。



倪一清教授在“传感技术分享”的交流介绍中, 从先进传感技术、智能振动、能量采集、机器学习及大数据分析等方面解读了传感技术研究焦点, 重点分享了石墨烯传感器在生物医药的应用。

上一篇

合肥市庐阳区双岗街道白水坝社区: 守望相助 幸福家园

下一篇

新征程“江”行! 解锁肥东民宿产业突围“密码”

24小时新闻排行

- 1 重走渡江胜利路 知行合一促成长
- 2 合肥市双岗街道万小店社区: 整治学...
- 3 合肥市庐阳区双岗街道五河路社区: ...
- 4 肥东县第三人民医院党支部开展主题...
- 5 合肥市庐阳区双岗街道小港湾社区: ...
- 6 十年答卷 | 从“工业首区”迈向“示范...
- 7 【新春走基层】全国书法家走进合...
- 8 肥西县上派镇: 摒弃交通陋习 安全文...
- 9 【暖民心行动】三措并举, 推进老年...
- 10 合肥市庐阳区双岗街道五河路社区: ...

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【科研抗災】INTACT系統預警風險 拆解城市建築抗風韌性

2023-12-20 20:00:16 香港



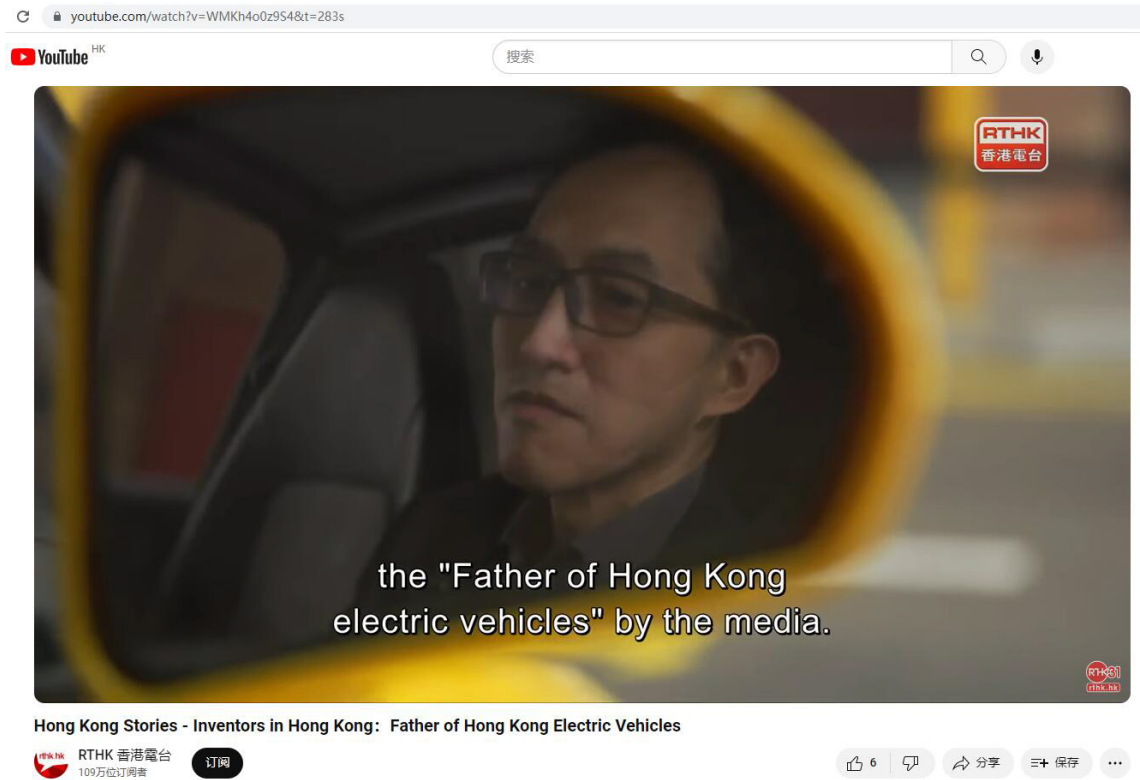
這個項目一共包括四個方面內容

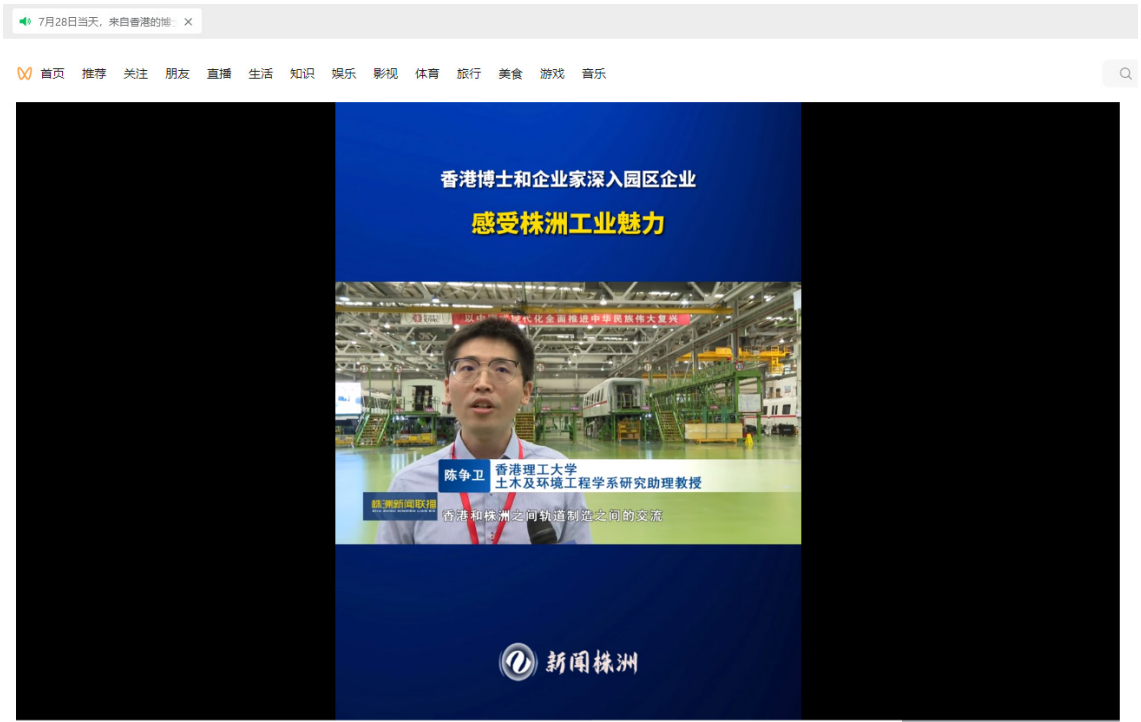
【編者按】全球氣候變化伴隨着的極端天氣，導致世界各地天災愈見頻仍，嚴重威脅每個人的財產以至生命。即使像香港這樣的現代化城市，今年夏天接連受強烈颱風及世紀暴雨衝擊，也一度面臨莫大困境。

點擊排行

- 1 「烏蠅頭」長駐灣仔海濱 吸引鐵路迷打卡
- 2 沙頭角設新景點吸引遊客
- 3 【治痛陷阱之漏洞待堵】四招走法律縛 不斷改名「洗白」
- 4 戴祖儀渴望躍飛躍進步獎 余詩曼 李施嬅獲誦好封后
- 5 港人退休變退養 專家倡延退休年齡
- 6 【方寸不亂】「女王」是怎樣煉成的
- 7 【聚焦廣東五大都市圈規劃】粵築五大都市圈 高質量同城化發展
- 8 美英干預香港司法「雙標」虛偽
- 9 【獨家風景】三人行必有我師









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