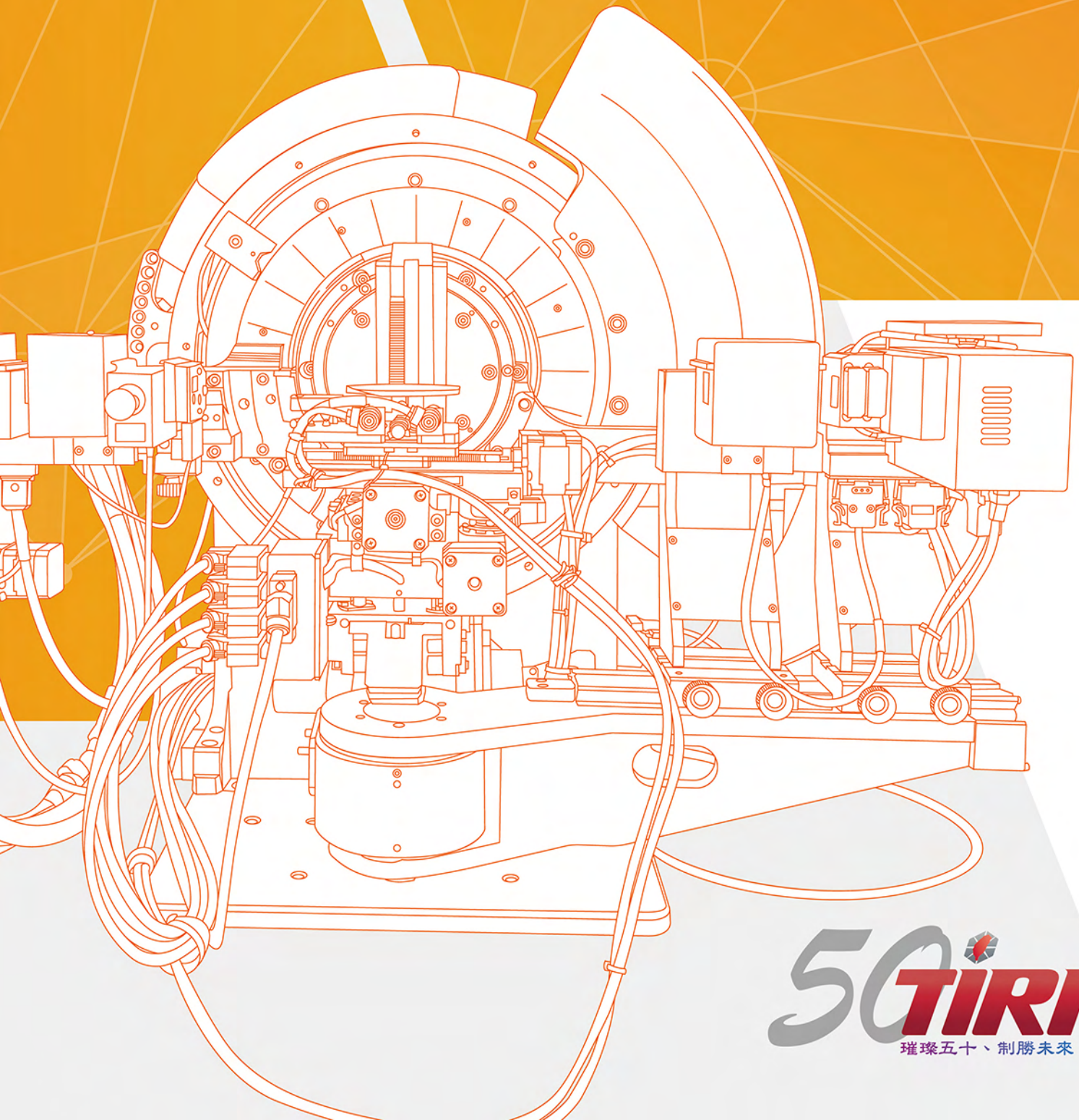
2024 ANNUAL REPORT

儀科中心 113 年報



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璀璨五十、制勝未來

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主任的話
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儀科中心是國家級的知名科研機構，定位爲產學研界「客製儀器的夢工廠」，自1974年成立以來，在2024年正式邁入五十週年！儀科中心配合政府施政方針，始終堅持以自主研發取代由國外供應的關鍵元件模組或儀器系統，提供前瞻科技與頂尖學研的特規儀器開發服務，致力於推動臺灣在儀器科技領域的發展，並爲國內外前瞻學術研究單位與產業界提供客製需求的解決方案，促進國家科技資源之有效運用與永續經營，創造更大之社會效益。

儀科中心繼往開來聚焦於「**精密光學**」、「**眞空鍍膜與設備**」與「**生醫光電**」專業領域，精進核心與關鍵技術素養，以儀器科技核心能量力挺學界開創前瞻的學術研究成果。儀科中心所建置「**先進材料製程研究聯合實驗室**」，協助陽明交大連德軒教授暨台積電聯合團隊共同進行「原子級超薄氧化物（氧化鋿）研究」，爲下世代半導體 3D 堆疊 (Monolithic 3D) 製程技術開發新材料；儀科中心提供光機電整合與眞空技術服務，與國內大學院校及研究單位之教授及研究團隊密切合作，共同研發多項尖端科學研究所需之客製特規儀器設備以進行前瞻科學研究，爲學研技術加值，協助其獲得「國研院研發服務平台亮點成果獎」、「國家新創獎」與「未來科技獎」等共14個獎項肯定！

儀科中心推動與執行國科會專案計畫，以跨領域整合、產學聯盟等方式提供協作技術服務平台，力助學研團隊提升研發量能、鏈結產業應用，包含「**A世代半導體**」專案計畫（跨4校7團隊2法人）、「**發展智慧製造及半導體先進製程資安實測場域**」專案計畫（跨8校6團隊3法人）、「**智慧微塵感測器技術研發服務平台**」專案計畫（跨3校6團隊2法人）等，橫向整合數個學研單位，橋接學界研究成果導入產業應用，培育下世代儀器技術高階研發人才。儀科中心同時也承辦國科會工程處所推動的五大智慧機械專案計畫聯合成果展，充分展現學界科技創新研發、國研院平台技術加值服務以及工程科技推展中心產學媒合等力量，獲選爲**賴政府行動創新100 days有感政績**。儀科中心並配合國家政策發展，近五年已協助國家太空中心完成研製超過十套福衛八號太空主鏡與次鏡鏡片，支持國家太空計畫任務與推動太空產業。

儀科中心亦積極建立國際合作，除派員參加國際研討會及展覽、參訪國際組織之外，同時邀請國際知名學者及優秀人士至儀科中心參訪或進行授課及訓練課程，重點國際學研產單位也透過專案委託及共同研究方式，進行實質合作交流深化國際夥伴合作關係；同時儀科中心落實產學研技術整合的宗旨，整合國內智慧機械領域學研團隊並與全球第一超精密加工系統供應商 **Moore Nanotechnology Systems, LLC (Nanotech)** 及**台灣大昌華嘉公司**合作建置「**超精密加工聯合實驗室**」，現已正式啟用支援開發精密光學元件，目標力助學研團隊提升研發能量，將臺灣精密光學元件製造技術推向世界，與國際接軌。

展望未來，儀科中心將以新研發大樓的啟動，建構「**前瞻半導體設備與材料在地化服務平台**」、「**學術、國防與太空自主光學系統研發基地**」以及「**器官晶片前瞻研究與產業推動服務平台**」等三大技術服務平台支援前瞻學術研究，爲科技創新提供更加穩固的基礎，橋接學界研發創意與產業需求，持續提升臺灣學界與產業儀器設備自主化的能量。

最後分享一個令人振奮的消息，儀科中心將於今年（2025年）正式更名爲**國家儀器科技研究中心（簡稱國儀中心）**，強調以研究爲導向的國家級單位，日後將進一步加強國際合作與技術創新，更有效率推動國家任務與政策，與各界攜手共同提升臺灣科技研發的國際競爭力，積極邁向下個五十年的領先之路！

Taiwan Instrument Research Institute (TIRI) is a renowned national research institution positioned as the "**Dream Incubator for Frontier Technology**" within the industry-academia-research community. Established in 1974, it officially celebrated its 50th anniversary in 2024. Aligned with government policies, TIRI has consistently followed the principle of replacing key components and instruments imported from abroad with domestically developed systems. TIRI provides customized instrument development services for cutting-edge technologies and leading academic and research institutions and is dedicated to promoting the development of

instrument technology in Taiwan. We provide tailored solutions for domestic and international forward-looking academic research units and industries to facilitate the effective utilization and sustainable management of national scientific and technological resources, strengthening societal benefits.

Moving forward, TIRI focuses on specialized fields—"**precision optics,**" "**vacuum coating and equipment,**" and "**biomedical optoelectronics**"—honing its core technological competencies. With the core strength of instrument technology, it supports the academic community in pioneering cutting-edge academic research achievements. Established by TIRI, "**Joint Laboratory for Advanced Materials Processing Research**" assisted the joint team by Assistant Professor Der-Hsien Lien, a Yushan Young Scholar at National Yang Ming Chiao Tung University and TSMC in researching "atomic-scale ultra-thin oxide (indium oxide)" to develop new materials for next-generation semiconductor 3D stacking (Monolithic 3D) process technology. TIRI provides opto-mechatronic integration and vacuum technology services, collaborating with professors and research teams from domestic universities and research institutions to jointly develop customized and specialized instruments required for various cutting-edge scientific research. This has enhanced the value of academic and research technologies, leading to 14 awards, including the NARLabs R&D Service Platform Highlighted Achievement Award, the National Innovation Award and Future Tech Award!

TIRI promotes and implements projects planned by the National Science and Technology Council (NSTC). It provides collaborative technology service platforms through interdisciplinary integration and industry-academia alliances to assist academic and research teams in enhancing R&D capacity, linking them to industrial applications. The projects include the "**Angstrom Semiconductor**" Initiative (involving 7 teams from 4 universities, and 2 research institutions), the "**IoT Information Security Development Project for Intelligent Manufacturing and Semiconductor Processing Testing Field**" (involving 6 teams from 8 universities, and 3 research institutions), and the "**Smart Dust Gas Sensor R&D Service Platform**" (involving 6 teams from 3 universities, and 2 research institutions). By horizontally integrating multiple academic and research units, it bridges the gap between academic research findings and their industrial applications. It cultivates the next generation of high-level R&D talents in instrument technology. Furthermore, TIRI hosted the joint achievement exhibition of the 5 intelligent

machinery projects promoted by the Department of Engineering and Technologies of NSTC. It demonstrates academic technological innovation and R&D, the value-added services of **NARLabs** platforms, and the industry-academia matchmaking efforts of the Engineering and Technology Promotion Center. It was selected as one of the **100 days' of notable innovation achievements of the Presidency of Ching-Te Lai.** Aligned with national policy development, TIRI has assisted the Taiwan Space Agency in developing more than 10 sets of Formosat-8 primary and secondary mirror lenses over the past five years, supporting national space mission tasks while promoting the space industry.

TIRI also actively establishes international cooperation. In addition to assigning personnel to participate in international conferences and exhibitions and visiting international organizations, it invites internationally renowned scholars and outstanding individuals to visit TIRI to conduct lectures and training courses. Key international academic, research, and industrial units collaborate and exchange through project commissions and joint research, deepening international partnerships. Adhering to the principle of industry-academia-research technological integration, TIRI integrates domestic academic and research teams in intelligent machinery. It has collaborated with **Moore Nanotechnology Systems,LLC (Nanotech)**, the world's No. 1 supplier of ultra-precision machining systems, and Taiwan's DKSH to establish the "**Joint Research Laboratory for Ultra-Precision Machining Technology.**" Since its official launch, this laboratory has supported the development of precision optical components to assist academic and research teams in enhancing their R&D capabilities. It promotes Taiwan's precision optical component manufacturing technology to the world, aligning with international standards.

Looking ahead, TIRI will leverage the launch of its new R&D building to establish three major technology service platforms: the "**Localization Platform for Semiconductor Process Equipment and Materials,**" the "**R&D Hub for Academia Collaboration, National Defense, and Spaceborne Remote Sensing Systems,**" and the "**Promotion Platform for Advanced Organ-on-a-chip Technology and Industry Development.**" These platforms will support cutting-edge academic research, provide a solid foundation for technological innovation, and bridge the gap between academic research and industrial needs. TIRI will enhance Taiwan's capabilities in localizing academic and industrial instrumentation continuously.

Finally, I have an exciting announcement to share. TIRI will officially change its name to the **National Center for Instrumentation Research** (**NCIR**) in 2025. This new name emphasizes its status as a research-oriented national institution. In the future, we will continue to strengthen international cooperation and technological innovation, promote national missions and policies, and work hand-in-hand with various sectors to enhance Taiwan's international competitiveness in technological R&D. We actively strive toward the path of leadership for the next fifty years!

主任 Director General 潘正堂 Chang-Tang Pan

基本概況
Overview of TIRI

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組織架構及人力配置
Organization Chart and Deployment of Manpower

主任室
Director General's Office

- **財會小組** Finance & Accounting Team
- **企劃小組** Office of Strategy & Planning
- **國際合作小組** Office of International Collaboration
- **技術服務組** Services & Promotion Division
- **資訊服務與資安組** Information Services and Information Security Division
- **行政服務與維運管理組** Administration & Facility Management Division

眞空技術與應用群 Vacuum Technology Group
- 眞空儀器與檢校技術組 Vacuum Instrument and Metrology Division
- 智慧鍍膜設備發展組 Intelligent Coating Equipment Technology Division
- 先進材料製程與設備組 Advanced Process and Equipment Development Division

光學技術與應用群 Optical Technology Group
- 精密光機製造技術發展組 Precision Optics Manufacturing Technology Division
- 智慧光學檢測儀器發展組 Intelligent Optical Inspection Technology Division
- 感測與光譜影像技術發展組 Sensing & Spectroscopy Imaging Technology Division

生醫晶片與系統整合技術群 Biomedical Chip And System Integration Technology Group
- 器官晶片製程與驗證組 Organ-on-a-Chip Fabrication and Verification Division
- 生醫儀器系統發展組 Biomedical Instrumentation Development Division
- 生醫平台與育成組 Biomedical Platform and Incubation Services Division

博士 Ph.D. 47 人
碩士 M.S. 84 人
學士 B.S. 26 人
其他 Other 2 人

總計 Total 169人

研究人員 Researcher 91 人
工程人員 Engineer 32 人
技術人員 Technician 11 人
行政人力 Administration staff 25 人

建構研發服務平台
Three Major R&D Service Platforms

儀科中心配合國科會政策並積極落實國研院賦予的任務，建構 3 大技術服務平台，包括「**前瞻半導體設備與材料在地化服務平台**」、「**學術、國防與太空自主光學系統研發基地**」與「**器官晶片前瞻研究與產業推動服務平台**」，攜手國內外頂尖大學、國內外研究機構、半導體學院、國防學研中心等，合作研發前瞻技術，協助自主開發高端科學研究儀器設備，以支援基礎研究、培育科技人才，並持續推動產學研聯盟，橋接學界前沿成果至五大信賴產業發展，落實前瞻設備技術在地化。

In order to efficiently execute the polices of National Science and Technology Council (NSTC) and the tasks assigned by National Applied Research Laboratories (NARLabs), TIRI has established 3 major technical service platforms, including the "**Localization Platform for Semiconductor Process Equipment and Materials**", the "**R&D Hub for Academia Collaboration, National Defense, and Spaceborne Remote Sensing Systems**" and the "**Promotion Platform for Advanced Organ-on-a-chip Technology and Industry Development**". With the benefit of the 3 platforms, TIRI is devoted to developing frontier technology while providing the key components and dominant instruments required by the NSTC 8 Major S&T Areas in collaboration with domestic top universities, colleges of semiconductor research, and research centers for national defense technology. It has always been TIRI's priority mission to support domestic fundamental research, cultivate scientific professionals, promote industry-academia-research alliance, commercialize academic innovation, and implement the localization of advanced equipment technology.

(1) 前瞻半導體設備與材料在地化服務平台
Localization Platform for Semiconductor Process Equipment and Materials

服務項目 Service Items

- 眞空計與線距標準件測試與校正
  Vacuum gauge & pitch standard calibration
- 光學薄膜元件量測與設計開發
  Optical thin film coating & metrology development
- 先進鍍膜製程設備開發
  Advanced thin film process and equipment development
- 眞空腔體客製設計與系統整合
  Vacuum chamber customization and system integration
- 奈微米薄膜製程及分析檢測
  Nano-micro thin film coating and inspection analysis
- 臨場薄膜鍍製監控系統開發
  In-situ monitoring & control system of thin film coatings
- 次埃解析度原子結構研發與應用
  Sub-Å microstructure investigation and applications
- 原子層鍍膜與蝕刻技術與設備
  ALD / ALE technology and equipment development

(2) 學術、國防與太空自主光學系統研發平台
R&D Hub for Academia Collaboration, National Defense, and Spaceborne Remote Sensing Systems

服務項目 Service Items

- 精密光學鏡頭 (元件) 客製設計與開發
  Customized design and fabrication for optical lens & components
- 航太級鏡片拋光與檢測服務
  Fabrication and inspection for meter-scale aspheric mirrors
- 航太級光學鍍膜客製開發
  Customized optical thin film coating for aerospace applications
- 反射式望遠鏡光機系統客製開發
  Optomechatronic systems of reflecting telescope
- 各類光學酬載實驗體開發
  R&D of various optical remote sensing payloads
- 高光譜儀與感測應用開發
  Development of hyperspectral image and applications

(3) 器官晶片前瞻研究與產業推動服務平台
Promotion Platform for Advanced Organ-on-a-Chip Technology and Industry Development

服務項目 Service Items

- 微流道製程試生產與製程標準化
  Trial production and standardization of microfluidic process
- 生醫晶片 / 器官晶片共通關鍵模組客製開發
  Customized modules for biomedical chip/organ-on-a-chip
- 生醫晶片 / 器官晶片 3R 替代科技驗證測試
  3Rs alternatives verification and testing for biomedical chip / organ-on-a-chip
- 生醫電子 / 光電產品檢測驗證與育成輔導
  Biomedical optoelectronics testing, verification & incubation services

核心價值與關鍵技術
Core Values and Key Technologies

儀科中心是國內唯一可針對學術界各領域，開發建置前瞻研究所需之客製特殊儀器設備的單位，長期專注在儀器技術平台的發展與應用，著重核心設施的維運與核心技術的精進，以作爲支援學術研究的堅實後盾，建構臺灣學界與產業儀器設備自主化的能量與契機。

TIRI is the only organization in Taiwan that can target all fields of academia and develop customized special instruments needed for cutting-edge research. It has long focused on the development and application of instrument technology platforms, the maintenance and operations of core facilities, and the refinement of core technologies. As a solid backing to support academic research, it offers an opportunity for Taiwan's academia and industry to develop autonomous instruments.

關鍵技術
Key Technologies

真空領域
Advanced Vacuum Technology

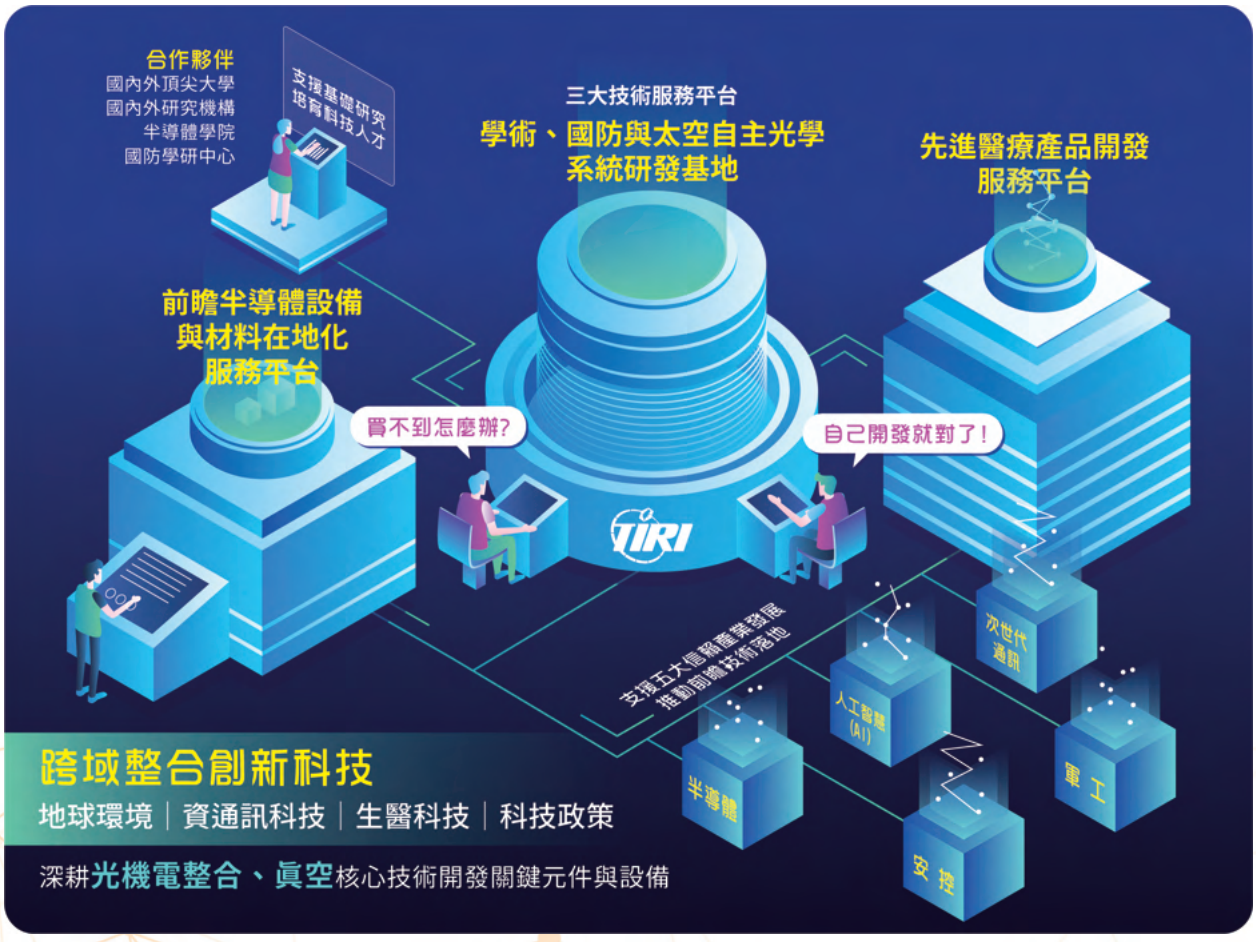
- 前瞻半導體製程驗證
  Advanced semiconductor processing
- 原子級設備研發
  R&D of atomic level equipment
- 先進材料開發
  Advanced material development

光學領域
Cutting-edge Optics

- 精密光機工程技術
  Precise opto-mechanical technology
- 高光譜遙測技術
  Hyperspectral remote sensing technology
- 尖端光電科學儀器
  Advanced opto-electro instruments

生醫領域
Biomedical Optoelectronics

- 醫材研發加速器
  Medical device accelerator
- 上市取證輔導
  Consultancy in FDA approval
- 生醫光電儀器開發
  Biomedical photonic & biophotonics instruments



主要服務面向
Main Services

- 執行重大政策任務 Executing crucial policy tasks (Government)
- 支援重要學術計畫 Supporting major academic projects (Academia)
- 新技術 (產業) 商品化 Commercializing novel technologies (Industry)
- 推動科普教育 Boosting popular science education (Talent Cultivation)

政府部門 Government

- 推動自研自製高階儀器設備在地化發展
  Striving for domestically self-developed and self-fabricated advanced instruments and facilities
- 發展衛星酬載遙測技術
  Developing satellite remote sensing technology
- 支援五大信賴產業推動方案
  Supporting the precision health programs under the "Five Trusted Industry Sectors"
- 支援建立災防預警系統
  Supporting the establishment of the disaster prevention and warning system
- 協助精準農業發展
  Assisting the development of precision agriculture

學術界 Academia

- 參與產學合作計畫、深耕計畫
  Participating in industry-university cooperation program and enhancement projects
- 支援學研計畫原型製作
  Supporting the prototyping of research programs
- 生醫團隊育成輔導及重點產業高階人才培育與就業計畫
  Cultivating and guiding biomedical teams, and carrying out the project of "Rebuild After PhD's Industrial Skill & Expertise (RAISE)"
- 共同合作研發前瞻研究所需之儀器科技與特用儀器系統
  Jointly researching and developing instruments, technologies, and special instrument systems for prospective research

產業界 Industry

- 客製化光電及眞空儀器系統及關鍵元組件開發
  Developing customized photonics and vacuum instrument system, as well as its critical components
- 提供精密光學元件設計製作及薄膜製程服務
  Providing the service of precision optical component design and production, as well as thin film processing
- 協助建立線上光學檢測及量測系統
  Assisting the establishment of the automatic optical inspection system in production lines
- 一站式醫材法規、測試、驗證服務
  Providing one-stop service related to medical device laws, testing, and verification
- 導入資安及智慧製造管理流程
  Introducing the information security and smart manufacturing management process

人才培育 Talent cultivation

- 舉辦儀器相關學生競賽
  Organizing instrument-related student competitions
- 儀器技術人才培育及科普教育
  Fostering talents in instrument technology and launching science popularization & education
- 出版科儀新知、儀科中心電子報
  Publishing "Instrument Today" and "TIRI eNEWS" for news, activities and instrument knowledge
- 參與國內外光電、眞空技術相關學術研討會
  Participating in domestic and international seminars on photonics and vacuum technologies

亮點成果與大事紀要
Notable Achievements & Milestones in 2024

2024/01/16

「超精密加工聯合實驗室」正式啟動 產學研共同培育國內超精密光學加工人才

The "Joint Research Laboratory for Ultra-Precision Machining Technology:" Launched to Cultivate Talents for Ultra-Precision Optical Machining in Taiwan

爲加強與學界之間的鏈結，儀科中心舉辦「超精密加工交流研討會」，並整合國內智慧機械領域學研團隊與國際超精密加工第一大廠 Moore Nanotechnology Systems, LLC (Nanotech) 合作建置「超精密加工聯合實驗室」，經由聯合實驗室的技術互通與設備共享，形塑完善的超精密光學設計製造人才培育基地，並與學研團隊協同建置完整訓練機制，共同培育國內超精密光學加工人才，將光學玻璃鏡片的製造工藝延伸於合金等先進材料之超精密加工，加速超精密加工技術於下一世代光學系統之精密元件研發，協助國內科研競爭力與產業升級，並將臺灣精密光學元件製造技術推向世界。

To strengthen the industry-academia collaboration, TIRI hosted the "Workshop on Ultra-Precision Machining Technology for Advanced Optics." It integrated Taiwan's research team in intelligent mechanics with Moore Nanotechnology Systems, LLC (Nanotech), the world's leading ultra-precision machining systems suppliers, to establish the "Joint Research Laboratory for Ultra-Precision Machining Technology." This collaboration will create a comprehensive training base for the cultivation of talent in ultra-precision optical design and manufacturing. TIRI also plans to collaborate with academic and research teams to establish a complete training mechanism, which will contribute to the development of internationally competitive talent in ultra-precision optical machining in Taiwan. TIRI extends the manufacturing process of optical glass lenses to advanced materials like alloys through ultra-precision machining. This acceleration of ultra-precision machining technology in the development of optical components for the next generation of optical systems not only aids in upgrading domestic industries but also propels Taiwan's precision optical component manufacturing technology onto the global stage by aligning with international standards.

國研院儀科中心「超精密加工聯合實驗室」正式啟動，國研院儀科中心潘正堂主任 (前排左四) 與 Nanotech 副總裁 Mr. Scott Gerhard (前排左五)，國內光學領域專家學者一同合影。

Group photo taken during the official launch of TIRI's "Joint Research Laboratory for Ultra-Precision Machining Technology". Dr. Cheng-Tang Pan, TIRI Director General (fourth from left, front row) and Mr. Scott Gerhard, Vice President of Nanotech (fifth from left, front row), along with experts and scholars in Taiwan's optics field.

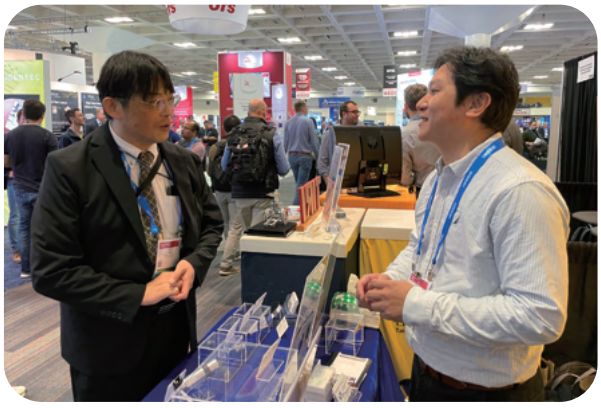
2024/01/27

儀科中心持續參與 SPIE Photonics West 2024 國際光電展

TIRI Continues to Participate in SPIE Photonics West 2024

儀科中心參加全球光電領域規模最大之國際會議及展覽活動 SPIE Photonics West 2024，透過國際研討會及光電領域專業展覽推廣，擴散儀科中心研發成果與技術能量，提升國際能見度。同時中心同仁也應邀至駐舊金山台北經濟文化辦事處科技組與海內外教授及光電廠商交流，分享產業經驗與建議。

TIRI participated in SPIE Photonics West 2024, the world's largest international conference and exhibition in optoelectronics. It promoted TIRI's R&D achievements and technological capabilities through international seminars and specialized exhibitions in the field of optoelectronics, enhancing its global visibility. TIRI colleagues were invited to Taipei Economic and Cultural Office in San Francisco, to share their industrial experiences and recommendations with professors and optoelectronics manufacturers from home and abroad.



儀科中心參展 SPIE Photonics West 2024 國際光電盛會，左圖爲美國 Nanotech 副總裁 Mr. Scott Gerhard (左二) 與臺大吳紀聖教授 (左三) 至攤位交流；右圖爲同仁與來自海內外的教授及光電廠商交流。

TIRI participated in SPIE Photonics West 2024. Left image: Mr. Scott Gerhard, Vice President of Nanotech (second from left) and Professor Jeffrey Chi-Sheng Wu of National Taiwan University (third from left) visited TIRI's booth. Right image: exchange with professors and optoelectronics manufacturers from home and abroad at the SPIE exhibition.

2024/03/16

儀科中心與美國機械工程師學會共同推動「國研盃智慧機械競賽」展現年輕學子實作能力

TIRI and ASME Jointly Promote the "NARLabs Smart Machinery Competition" to Demonstrate Young Students' Practical Skills

儀科中心協同美國機械工程師學會 (American Society of Mechanical Engineers, ASME) 臺灣分會合作舉辦「國研盃智慧機械競賽」學生競賽 (SPDC)，分爲設計競賽及演講競賽，每年的設計競賽主題多元且貼近生活，藉此引導學生運用學理基礎搭配實務製作的能力，吸引更多年輕學子投入儀器設備設計與製造領域。 113 年設計競賽題目爲「機器人迷你高爾夫挑戰賽 (Robot Mini Golf)」，本年度由國立聯合大學「機器人的高爾夫球之旅」團隊勇奪設計競賽第一名、演講競賽則由國立清華大學張宸瑋同學奪冠。

TIRI has collaborated with the American Society of Mechanical Engineers (ASME) Taiwan Section, to organize the Student Professional Development Conference (SPDC) competition, officially named the "NARLabs Smart Machinery Competition." SPDC is divided into design and presentation competitions. The theme of the design contest every year, characterized by being interdisciplinary and close to life, guides students to combine theory with practice while attracting more students to consider instrumentation design and manufacturing. The title of the 2024 design competition was "Robot Mini Golf." "The Robot's Golf Journey" team from National United University won 1st place in the design competition this year. Chen-We Chang from National Tsing Hua University won the speech competition.

「國研盃智慧機械競賽」比賽現場與頒獎典禮大合照
Group photos: The competition site (left image) and the awards ceremony for "NARLabs Smart Machinery Competition" (right image).

2024/03/27

「科學家的秘密基地」科普展覽 展現遙測衛星光學鏡片研製技術

The "Secret Bases of Scientists" Exhibition Showcases Optical Lens Development Technology for Remote Sensing Satellite

國研院、國家太空中心與國立臺灣科學教育館合作舉辦總期程長達三年的「科學家的秘密基地」科普展覽，藉由互動式的展覽，讓一般民眾對國家級研究單位所做的工作有初步認識，也從中學習基本的科學知識。儀科中心展示展出遙測衛星福爾摩沙衛星五號的光學系統架構模型，配合文字與圖片解說與手翻式問答互動遊戲，幫助民眾了解遙測衛星的取像原理，致力將尖端科技轉化為中小學生都能有基本認識的科普展覽與活動，提升全民科學素養。

The NARLabs collaborated with the Taiwan Space Agency (TASA), and the National Taiwan Science Education Center (NTSEC) in holding a three-year-long special exhibition "Secret Bases of Scientists." Visitors are expected to discover their delights of playing with science through interactive games. Meanwhile, they will deepen their understanding of how scientific research is conducted. TIRI exhibits a structural model of FORMOSAT-5 under the optical system. Visitors can better understand the imaging principle of a remote sensing satellite through the captioned pictures and hand-flipping Q&A paperboards. TIRI endeavors to expose cutting-edge technologies to elementary school students and junior/senior high school students in a comprehensible manner. This special exhibition aims to let the students find interest in science and develop their scientific competencies.

藉由「科學家的秘密基地」互動式展覽，儀科中心展示遙測衛星光學系統架構模型及鏡片。
TIRI demonstrated optical system architecture models and lenses of the remote sensing satellite through the "Secret Bases of Scientists" interactive exhibition.

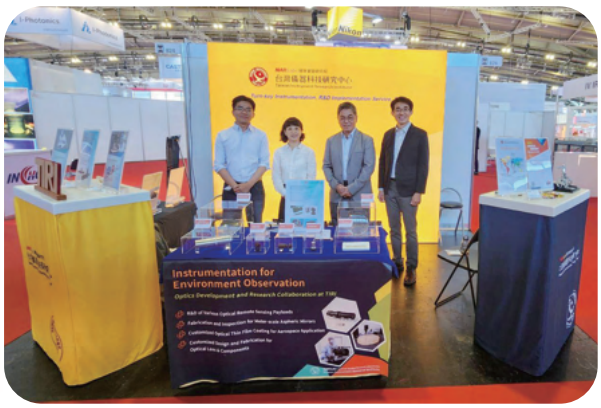
2024/05/14

掌握光電領域脈動 儀科中心參與第 16 屆德國法蘭克福 Optatec 展覽

TIRI Joins the 16th Optatec in Frankfurt, Germany, to Keep Pace with the Optoelectronics Field

因應國研院推動國際化、打造世界級實驗室目標，儀科中心參與第 16 屆法蘭克福光學暨雷射科技展 (Optatec 2024)，本展覽為雷射光學界的指標性展覽，儀科中心展示各式客製化光學鏡頭與組件及自主開發智慧 3D 光學先進封裝檢測系統，獲得相當多來訪者青睞，成功推廣中心的光學設計及加工技術。

Aligned with the goal of NARLabs to promote internationalization and build a world-class laboratory, TIRI participated in the 16th Optatec 2024 in Frankfurt, Germany—the leading exhibition for laser optics. TIRI displayed a variety of customized optical lenses and components as well as the self-developed intelligent 3D optical advanced package inspection system. It attracted numerous visitors, successfully promoting TIRI's optical design and processing technology.



左圖為儀科中心參與第 16 屆德國法蘭克福 Optatec 光電展；右圖為團隊積極解說拓展潛在合作機會。
Left image: TIRI's participation in the 16th Optatec in Frankfurt, Germany. Right image: TIRI colleagues engaged with visitors, fostering potential opportunities for collaboration.

儀科中心參與 IEEE I²MTC 2024 鏈結國際重要儀器科技社群

TIRI's Participation in IEEE I²MTC 2024 Strengthens Connections with Key International Instrumentation Communities

儀科中心長期耕耘國際社群組織電機電子工程師學會儀器與測量協會 (IEEE Instrumentation & Measurement Society, IEEE IMS) 及營運 IEEE IMS 臺北支會，學會年度旗艦型國際研討會 IEEE International Instrumentation and Measurement Technology Conference (I²MTC) 於英國格拉斯哥盛大舉辦，藉由發表科技研究成果，並輔以攤位參展方式，積極推廣核心研發技術能量。同時，潘正堂主任以支會主席身分代表參加學會年度全球支會主席會議，報告臺北支會營運概況並與學會核心幹部交流，發揮國際影響力。

TIRI is actively involved in the IEEE Instrumentation and Measurement Society (IMS), operating the IMS Taipei Chapter. The Society's flagship international conference—the IEEE International Instrumentation and Measurement Technology Conference (I²MTC)—was held in Glasgow, UK. By presenting scientific and technological research achievements, coupled with the booth exhibition, TIRI actively promoted its core R&D technological capabilities. As the Taipei Chapter Chair, Director General Cheng-Tang Pan attended the annual Chapter Chair Summit, where he reported on the Taipei Chapter's activities and engaged in discussions with the Society's core officers, contributing to expand its international influence.

儀科中心參與 IEEE I²MTC 2024，左圖爲儀科中心團隊與 IMS 學會核心成員合影；右圖爲潘正堂主任出席全球支會主席會議。
TIRI participated in IEEE I²MTC 2024. The left image shows the TIRI team with core members of the IMS Society, where the right image features Director General Cheng-Tang Pan attending the global Chapter Chair Summit.

2024/08/16

2024 半導體原子級鍍膜技術交流會暨教師研習工作坊搭建產學研三方合作橋梁

The 2024 ALD Technology for Semiconductor Application Symposium & Workshop Builds a Bridge between Industry, Academia, and Research

儀科中心與國立臺北科技大學（北科大）共同舉辦「2024 半導體原子級鍍膜技術交流會暨教師研習工作坊」，除了國內相關領域之各大專校及高中職院教師參與，並有超過 22 家國內外廠商、10 家學研單位一同共襄盛舉！本交流會聚焦於 ALD 在半導體製造中的關鍵應用，邀請產學各界專家分享最新研究成果以及應用，北科大王錫福校長同時也是台灣鍍膜科技協會理事長，特別邀請台積電技術研究處張孟凡處長分享先進半導體科技發展面臨的人才與技術挑戰，講述 AI 的興起以及因應未來台積電人才培育策略。儀科中心藉由這次與北科大擴大舉辦技術交流會暨教師工作坊，除了分享更多半導體相關技術給種子教師，更爲產學研搭建起一個交流合作的橋樑，期待未來能與大家一起攜手推動半導體技術的創新突破，攻克技術難關！

TIRI and the National Taipei University of Technology (NTUT) co-organized the "2024 ALD Technology for Semiconductor Application Symposium & Workshop." This was a tremendous event attended by not only teachers from various universities, colleges, and high schools in related fields in Taiwan but also representatives from over 22 domestic & international companies, and 10 academic & research institutions. Focusing on the key applications of ALD in semiconductor manufacturing, the event invited experts from industry and academia to share their latest research findings and applications. President Sea-Fue Wang of NTUT, also the Chair of the Taiwan Association of Coating and Thin Film Technology (TACT), specially invited Meng-Fan (Marvin) Chang, Director of Corporate Research at TSMC. Meng-Fan (Marvin) Chang discussed the talent and technological challenges faced by developing advanced semiconductor technology, the rise of AI, and TSMC's strategy for cultivating talents in response to future needs. By expanding this symposium and workshop with NTUT, TIRI has not only shared more semiconductor-related technologies with seed teachers, but also built a bridge for communication and collaboration between industry, academia, and research. It is expected to create more future collaborations that drive innovative breakthroughs and overcome technical challenges in semiconductor technology!

左圖爲 2024 半導體原子級鍍膜技術交流會暨教師研習工作坊實況；右圖左二起爲北科大王錫福校長、台積電張孟凡處長於活動現場合影。

Left image: the 2024 ALD Technology for Semiconductor Application Symposium & Workshop on-site. Right image: (left to right) President Sea-Fue Wang of NTUT, and Director Meng-Fan (Marvin) Chang of TSMC, a group photo at the event.

國科會「智慧機械科技創新館聯展」獲選爲賴政府 100 days 有感政績

The NSTC Intelligent Machinery Innovation & Collaboration Exhibition Selected as One of the 100 Days' Notable Achievements of the Presidency of Ching-Te Lai

儀科中心承辦國科會工程處所推動的五大智慧機械專案計畫聯合成果展，於臺灣機器人與智慧自動化展 / 2024 台北國際自動化工業大展，以「國科會智慧機械科技創新館」專館形式參加展出，集結國科會五大智慧機械相關專案計畫，包含「次世代智慧製造關鍵技術研發」、「虛實加工技術開發與智能化系統整合」、「人機協作機器人技術開發與系統整合」，以及由儀科中心所執行之「智慧微塵感測器技術研發」與「發展智慧製造及半導體先進製程資安實測場域」等五項專案計畫共 22 個學界團隊參展。本次活動獲選爲賴政府行動創新 100 days 有感政績，充分展現學界科技創新研發、國研院平台技術加值服務以及工程科技推展中心產學媒合等力量，加速學界研發成果落實產業應用，共同建構智慧機械創新生態圈，提升國家競爭力。

TIRI hosted "NSTC Intelligent Machinery Technology Innovation Pavilion," showcasing the five intelligent machinery projects promoted by the Department of Engineering and Technologies of the NSTC at the Taiwan Automation Intelligence and Robot Show/Automation Taipei 2024. The projects included the "Special Research Program on Key Technology Development for Next Generation Smart Manufacturing," "Promotion Program on Advanced Digital Twin of Manufacturing Integration Technology," and "Human Robot Collaboration and System Integration," as well as "Smart Dust Sensor Technology Reaserach and Development" and the "Developed of Security Testing Field for Internet of Things Application" conducted by TIRI. Twenty-two academic teams participated in the exhibition. The event was selected as one of the 100 days' of notable innovative achievements of the Presidency of Ching-Te Lai. This achievement demonstrates the strengths of academic technological innovation and R&D, the value-added services provided by NARLabs' platform technologies, and the industry-academia collaboration facilitated by the Engineering & Technology Promotion Center. It has accelerated the implementation of academic R&D achievements in industrial applications, jointly constructing an innovative ecosystem for intelligent machinery while enhancing international competitiveness.

國科會「智慧機械科技創新館聯展」集結國科會智慧機械相關專案計畫，展現學界研發團隊之創新研發能量；右圖中爲蕭美琴副總統至攤位聆聽團隊報告。

The NSTC Intelligent Machinery Technology Innovation Pavilion brought together the intelligent machinery related projects and programs promoted by NSTC. It showcased the innovation and R&D capabilities from the academia. The image on the right shows Vice President Bi-Khim Louise Hsiao listening to the team's presentation.

2024/09/04

2024 臺灣國際半導體展 推廣前瞻半導體技術研發成果

SEMICON Taiwan 2024 Promotes R&D Achievements in Forward-Looking Semiconductor Technologies

儀科中心發展下世代前瞻關鍵儀器之自主研發與二維材料應用服務平台，於臺灣國際半導體展 (SEMICON Taiwan) 展示先進製程設備及客製特規光學元件服務成果，並安排儀科中心光學領域與眞空技術的資深專家到場與產業先進對談，了解產業需求及技術瓶頸。除了攤位展示活動，儀科中心亦參與「半導體先進檢測與計量論壇」，發表自行開發應用於次世代半導體設備之臨場檢測技術，介紹可整合多樣製程系統及薄膜檢測分析模組之叢集式臨場檢測系統，可作爲半導體新穎材料製程研發時的有力工具，提升製程良率與可靠度。

TIRI has developed R&D service platforms focused on the critical key instruments and the application of 2D materials application for next-generation semiconductors. The fruitful results of TIRI's advanced process equipment and customized optical components were displayed at SEMICON Taiwan, where TIRI's senior experts on optics and vacuum technology held discussions with the pioneers of the industry to understand the technical needs and bottlenecks. In addition to booth demonstrations, TIRI participated in the "Semiconductor Advanced Inspection and Metrology Forum" by presenting the *in-situ* inspection technologies developed by TIRI for next-generation semiconductor devices. TIRI also introduced the clustered inspection system that integrates various process systems and thin film inspection and analysis modules. These tools support R&D on novel semiconductor materials, enhancing process yields and reliability.

儀科中心於「2024 臺灣國際半導體展」推廣前瞻半導體技術研發成果；右圖爲儀科中心柯志忠組長於「半導體先進檢測與計量論壇」發表自行開發應用於次世代半導體設備之臨場檢測技術。

TIRI promoted forward-looking semiconductor technology at "SEMICON Taiwan 2024." The image on the right shows Chi-Chung Kei, TIRI's team leader, presenting novel *in-situ* inspection technologies developed by TIRI for the next-generation semiconductor at the "Semiconductor Advanced Inspection and Metrology Forum."

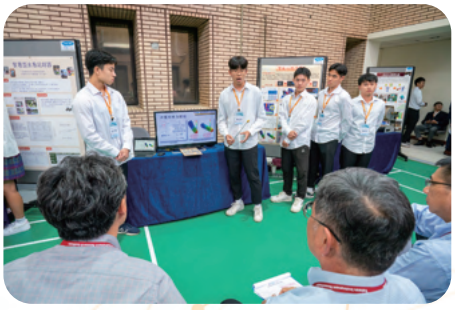
「國研盃 *i*-ONE 儀器科技創新獎」助創新學子邁向國際舞台

"NARLabs *i*-ONE Instrument Technology Innovation Competition" Helps Innovative Students to Enter the International Arena

第 16 屆「國研盃 *i*-ONE 儀器科技創新獎」全體合影
Group photo of the 16th "NARLabs *i*-ONE Instrument Technology Innovation Competition"

「國研盃 *i*-ONE 儀器科技創新獎」長期推動儀器自製人才培育，已邁入第 16 屆，本競賽鼓勵學子透過關心永續發展議題、觀察日常需求，培養面對未來世界的創新思維能力，今年專上組由國立清華大學（清大）團隊的作品「全場應力與拉壓狀態自動化量測系統」奪得首獎，中學組由國立嘉義高級工業職業學校團隊（嘉義高工）所完成之「智能化微沖儀」獲得首獎。協辦單位電機電子工程師學會儀器與測量協會 (IEEE Instrumentation & Measurement Society, IEEE IMS) 臺北支會將推薦 *i*-ONE 專上組得獎團隊於 2025 年赴德國參加 IEEE IMS 國際學生競賽，讓臺灣學子獲得在國際上展示自己獨特創新儀器的機會。

清大團隊進行作品解說
Teams from NTHU presenting their projects



嘉義高工團隊進行作品解說
Teams from CYIVS presenting their projects

The NARLabs *i*-ONE Instrument Technology Innovation Competition" continually promotes the cultivation of instrumentation talents, entering its 16th session. This competition encourages students to care about sustainable development issues, observe daily needs, and cultivate innovative thinking to address future global challenges. This year, 1st prize for the College and Above Group went to the National Tsing Hua University (NTHU) team for their work "Automated Measurement System for Whole-Field Stress and Tensile/Compression State." 1st prize for the High School Group was awarded to the team from National Chia-Yi Industrial Vocational High School (CYIVS) for their "Development of Intelligent Micro Punching Machine." The co-organizer, the IEEE Instrumentation & Measurement Society (IEEE IMS) Taipei Chapter, recommend the winner of *i*-ONE college and above group to participate in the International IMS Student Contest in Germany in 2025. This will allow Taiwanese students to showcase their unique, innovative instruments on the international stage.

2024/10/09

科普特展—《與「光」同行—解析「光學薄膜」的奧秘》

Special Exhibition – "Walking in Light: Revealing the Mysteries of Optical Thin Films" Launched at the National Taiwan Science Education Center

國研院及國家太空中心，與國立臺灣科學教育館合作，辦理「科學家的秘密基地」長期展，全面更新展品後重新開展，儀科中心推出《與「光」同行—解析「光學薄膜」的奧秘》科普展覽，展出各式光學薄膜鍍製樣品、各種裝飾膜以及太空望遠鏡所使用的帶通濾光片等，幫助民眾認識光學薄膜鍍製技術所運用之光學知識，了解光學薄膜提升光學系統性能之原因及其在光學系統的重要性，讓年輕學子及家長們了解臺灣多年來投入光學鍍膜技術研究領域所取得的成就，並從中學習基本的科學知識。

NARLabs and the Taiwan Space Agency, in collaboration with the National Taiwan Science Education Center, have re-launched the "Secret Bases of Scientists" long-term exhibition after its exhibits have been updated. TIRI has launched the science popularization exhibition "Walking in Light: Revealing the Mysteries of Optical Thin Films."The exhibit displays a variety of optical thin film samples, decorative films, and bandpass filters used in space telescopes. Visitors can learn about the optical coating technologies, understand why optical thin films enhance the performance of optical systems, and recognize their importance. They will also be introduced to Taiwan's notable achievements in the field of optical coating research over the years.

儀科中心《與「光」同行—解析「光學薄膜」的奧秘》
The special exhibition of "Walking in Light: Revealing the Mysteries of Optical Thin Films."

2024/11/20

璀璨五十 致勝未來 50 週年感恩歡慶暨研發大樓竣工典禮

Shining Bright for Fifty Years, Striving for Future Success: The 50th Anniversary Celebration and R&D Building Completion Ceremony

儀科中心自 1974 年成立以來，堅持以自主研發取代由國外供應的關鍵元件模組或儀器系統，致力於推動臺灣在儀器科技領域的發展，並爲國內外前瞻學術研究單位與產業界提供技術支援與服務。回顧過去 50 年的卓越成就，並展望未來的創新發展，來自政府、學術界和產業界逾百位嘉賓齊聚一堂，共同見證這個重要的里程碑。儀科中心將以新大樓的啟動，爲科技創新提供更加穩固的基礎，並以三大技術服務平台支援前瞻學術研究之需求，攜手各界共同提升臺灣科技研發的國際競爭力。

Since its establishment in 1974, TIRI has been steadfast in its commitment to autonomous research and development, reducing reliance on key components and instrument systems imported from abroad. TIRI has played a pivotal role in advancing Taiwan's instrument technology, providing technical support and services to forward-thinking research institutions and industries both domestically and internationally. Looking back over 50 years of outstanding achievements and looking forward to future innovative development, over 100 guests from the government, academia, and industry gathered to witness this milestone. With launching the brand-new innovation hub, TIRI provides a solid foundation for technological breakthroughs and supports the needs of forward-looking academic research through three technical service platforms. It works with all sectors to enhance Taiwan's international competitiveness in scientific and technological R&D.

儀科中心歡慶五十週年，產學研逾百人齊聚一堂共同見證這個重要的里程碑；右圖爲創新基地的啟動，邁向下個50年的全球領先之路。
TIRI celebrated its 50th Anniversary with more than 100 people involved in industry, academia, and research to witness this milestone. The image on the right shows the launch of the innovation hub, leading globally for the Next 50 Years.

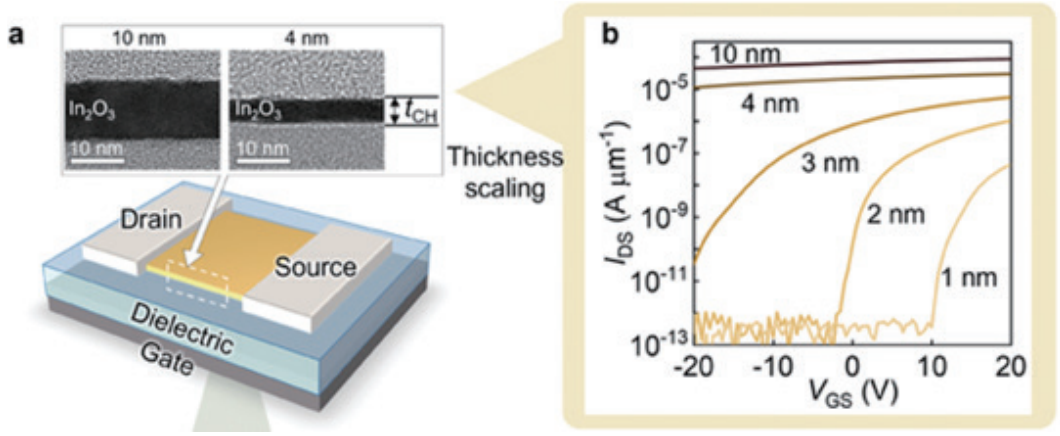
2024/12/09

攜手產學界開發下世代半導體 3D 堆疊技術之新材料

Collaborating with Industry and Academia to Develop New Materials for Next-Gen Semiconductor 3D Stacking Technology

儀科中心與國立陽明交通大學（陽明交大）連德軒教授（玉山青年學者）暨台積電聯合團隊共同進行「原子級超薄氧化物（氧化銦）研究」，爲下世代半導體 3D 堆疊技術之新材料。儀科中心提供原子層鍍製設備，以及材料合成、元件製作等技術服務，與團隊共同研發控制氧化銦電晶體的導電性，以及調節電晶體載子濃度之機制，並驗證可實際投入產線製程。此項重要成果榮登國際知名學術期刊《Advanced Materials》，引領積體電路技術，維持世界競爭力。

TIRI is jointly working with Professor Der-Hsien Lien (Yushan Young Scholar) of National Yang Ming Chiao Tung University (YMCT) and TSMC to conduct "Research on Atomic-Scale Ultra-Thin Oxide (Indium Oxide)," developing new material for next generation semiconductor 3D stacking technology. TIRI has provided atomic layer deposition equipment, material synthesis, component fabrication, and other technical services. The team has developed a mechanism for controlling the conductivity of indium oxide transistors and regulating the carrier concentration. This technology has been verified as it can be practically applied on the production line. This significant achievement has been published in the prestigious journal "*Advanced Materials,*" leading IC technology while maintaining international competitiveness.



儀科中心與陽明交大暨台積電聯合團隊研究成果榮登國際知名學術期刊《*Advanced Materials*》；
圖片來源：Breaking the Trade-Off Between Mobility and On–Off Ratio in Oxide Transistors《*Advanced Materials*》。
Research achievements of the joint team from TIRI, YMCT, and TSMC published in the internationally recognized academic journal *Advanced Materials*.
Image source: Breaking the Trade-Off Between Mobility and On–Off Ratio in Oxide Transistors, *Advanced Materials.*

「國家科技寶藏－科學家的秘密基地2.0」於高雄科工館盛大開展

"Taiwan's Technological Treasures: Secret Bases of Scientists 2.0 " was Launched at the National Science and Technology Museum in Kaohsiung

國研院轄下各中心及國家太空中心，與國立科學工藝博物館（科工館）合作，辦理為期一年的「國家科技寶藏－科學家的秘密基地 2.0」特展，儀科中心規劃高光譜影像互動遊戲，由觀眾擔任光譜科學糾察隊，藉由觸控螢幕以神奇的光學檢測技術，辨識出每個物體獨有的光譜訊息，包含品質檢驗、找出完美的標準、辨識不同的材料、外來種，甚至還能發現水果甜度高低的秘密！藉由有趣的科學遊戲機台、難得一見的科技展品以及淺白的科學知識介紹，讓民眾對國家級研究單位所做的工作有初步認識，並從中學習基本的科學知識。

NARLabs and Taiwan Space Agency, in collaboration with the National Science and Technology Museum, held a one-year special exhibition: the "Taiwan's Technology Treasures: Secret Bases of Scientists 2.0." TIRI has planned an interactive game of hyperspectral imaging; visitors take on the role of the Spectrum Science Task Force. Through touchscreen games, they utilize advanced optical detection technology to identify the unique spectral signatures of various objects and solve challenging problems in each level. These include quality inspection, finding the perfect standards, identifying different materials and invasive species, and even uncovering the secrets behind the sweetness of fruits. Completing the tasks and earning a spectral cube allows visitors to advance to the next stage. Through interactive science games, unique tech exhibits, and easy-to-understand scientific presentations, the public can explore the work of national research institutions and gain basic scientific knowledge.

藉由展品展示及互動遊戲，儀科中心展出高光譜技術相關科普內容。

Through exhibits and interactive games, TIRI has demonstrated and popularized hyperspectral technologies.

113 年獲獎記錄
Awards in 2024

儀科中心以核心技術創造卓越價值，榮獲「**第十八屆國家實驗研究院傑出科技貢獻獎**」肯定，得獎名單如下：

TIRI has been recognized by receiving the "**18th NARLabs Outstanding Science and Technology Contribution Awards**" for creating outstanding value with its core technologies. The 2024 list of awards is detailed below.

「技術服務」優等獎—智慧微塵感測器技術研發服務平台
Excellence Award for Technology Services–Smart Dust Sensor Technology Development and Service Platform

成果說明：

本服務平台透過與學界橫向聯繫、垂直整合模式，協助學界感測器研發，進行感測器元件製程技術、系統電路與模組化設計等加值服務，以縮短在感測器研發技術整合與產業化銜接時程，提高國內感測器自主化研發能量與國際競爭優勢。

「智慧微塵感測器技術研發服務平台」團隊
Smart Dust Sensor Technology Development and Service Platform Team

Achievements:

This service platform assists academia in sensor R&D through horizontal linkage in a vertical integration model. It provides value-added services, including sensor component process technology, system circuitry, and modular design, to shorten the integration of sensor R&D technology and industrialization. It enhances Taiwan's sensor R&D capability and international competitive advantage.

「技術發展」優等獎—高能電漿物理氣相沉積技術開發與應用
Excellence Award for Technology Development–Development and Application of High-Energy Plasma Physics Vapor Phase Technology

「高能電漿物理氣相沉積技術開發與應用」團隊
Development and Application of High-Energy Plasma Physics Vapor Phase Technology Team

成果說明：

儀科中心長期深耕眞空科技，培養出具關鍵指標的眞空製程相關設備與儀器系統的客製開發能力，因應支援國內外學術研究及光電與半導體產業對上游製程設備與材料前瞻技術開發需求，發展可大面積（8吋-12吋）濺鍍磊晶單晶氮化物薄膜、鍍製高機械及光學特性之下世代光學濾光片與先進半導體曝光製程所需EUV極紫外光反射鏡光學薄膜，滿足研發導向的需求、協助學術研究成果，亦協助產業提升效能。

Achievements:

TIRI is deeply engaged in vacuum technology and has cultivated the capability of customized development of vacuum process-related equipment and instrumentation systems with key indicators. The goal is to support domestic and international academic research and the optoelectronics and semiconductor industries to develop forward-looking technologies for upstream process equipment and materials. Thus, TIRI has developed an epitaxial single crystal nitride film of large area sputtering (8" to 12"). It has deposited EUV reflector films required by next gen optical filters with high-mechanical and optical properties and advanced semiconductor exposure processes. These achievements meet R&D needs, assisting in successful outcomes while helping the industry to enhance efficiency.

儀科中心利用長期累積的光機電整合與眞空技術服務，建構跨領域客製儀器研發服務平台支援學術研究，並提供新創醫材測試及輔導取證等加值服務，協助學研團隊獲得**國家實驗研究院研發服務平台亮點成果獎**、**國家新創獎**與**未來科技獎**等多項肯定，113 年度獲獎紀錄整理如下表：

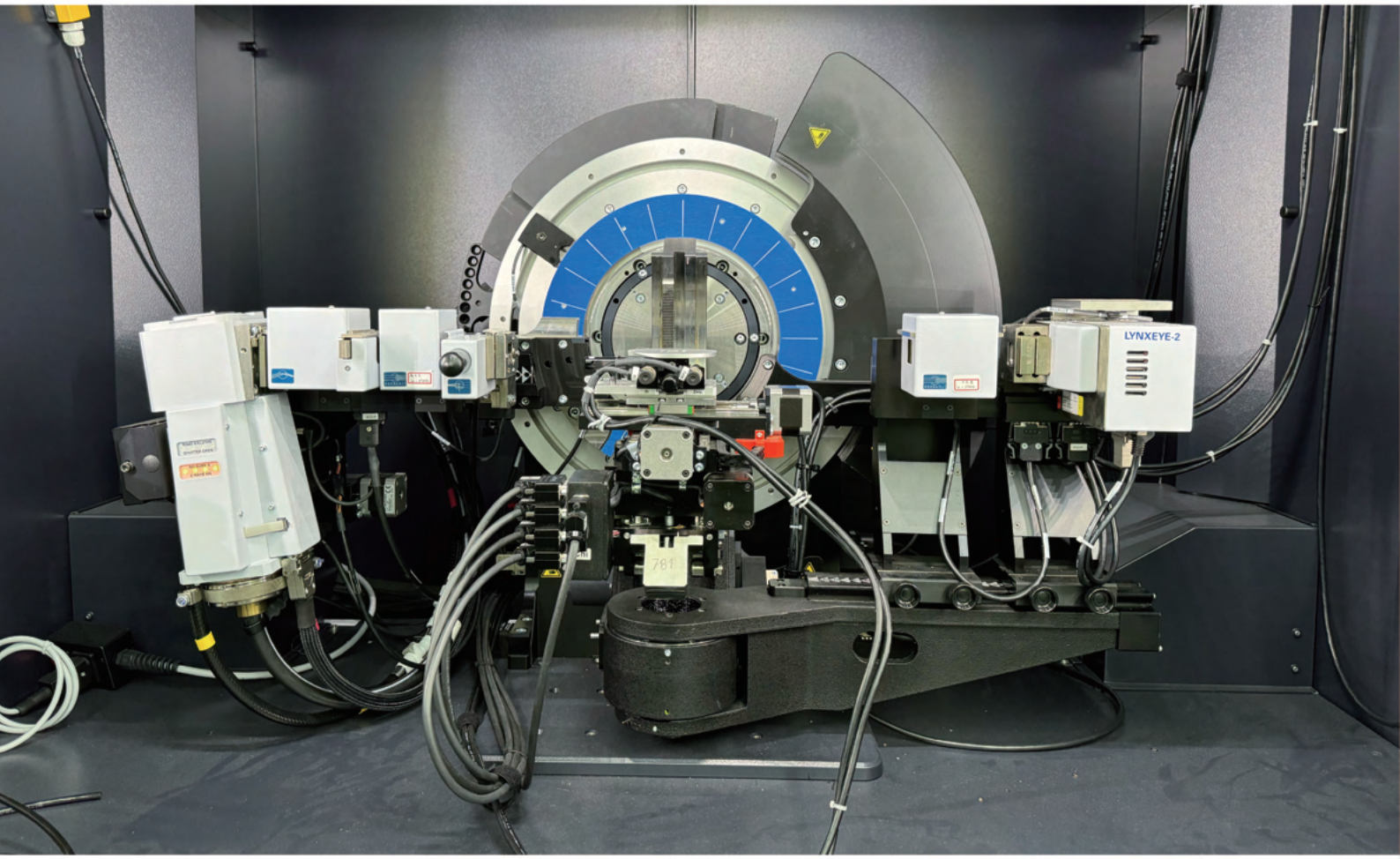
Leveraging its long-accumulated expertise in the integration of optics, mechanics and electronics, and vacuum technology services, TIRI has established a cross-discipline customized instrumentation R&D service platform to support academic research. It provides value-added services such as testing for innovative medical materials and counseling for obtaining certificates. TIRI has assists research and academic teams in obtaining the **NARLabs R&D Service Platform Achievement Awards**, the **National Innovation Award & Future Tech Award**, among others.

競賽活動 Activities	得獎隊伍 Teams	獲獎項目 Prizes
國研院研發服務平台 亮點成果獎 NARLabs R&D Service Platform Achievement Awards	儀科中心「光學系統整合研發聯盟平台」服務成果： 臺大薛文証教授團隊 Awarded through TIRI's Optical Systems Integration R&D Consortium Platform: Prof. Wen-Jeng Hsueh's team, NTU	優等獎 Excellence Award
	儀科中心「先進材料製程研究聯合實驗室」服務成果： 陽明交通大學連德軒教授團隊 Awarded through TIRI's Joint Laboratory for Advanced Materials Processing Research Platform:Prof. Der-Hsien Lien's team, NYCU	佳作獎 Honorable Mention Award
	儀科中心「高光譜顯微影像分析研發服務平台」服務成果： 中央大學王智明教授團隊 Awarded through TIRI's R&D Service Platform for Hyperspectral Microscopic Imaging Analysis Platform:Prof. Chih-Ming Wang's team, NCU	佳作獎 Honorable Mention Award

競賽活動 Activities	得獎隊伍 Teams	獲獎項目 Prizes
2024 未來科技獎 The Tech Innovation Excellence Award (TIE Award)	儀科中心與成功大學林志隆教授團隊 TIRI and Prof. Chih-Lung Lin's team from NCKU	2024 未來科技獎 2024 TIE Award
	儀科中心「氣體感測器服務平台」服務成果：清大闕郁倫教授團隊 Awarded through TIRI's the Smart Dust Gas Sensor R&D Service Platform: Prof. Yu-Lun Chueh's team, NTHU	2024 未來科技獎 2024 TIE Award
	儀科中心「器官晶片服務平台」服務成果：清大曾繁根教授團隊 Awarded through TIRI's Advanced Organ-on-a-chip Technology & Development Platform: Prof. Fan-Gang Tseng's team, NTHU	2024 未來科技獎 2024 TIE Award
	儀科中心「器官晶片服務平台」服務成果：陽明交大李鎮宜教授團隊 Awarded through TIRI's Advanced Organ-on-a-chip Technology & Development Platform: Prof. Chen-Yi Lee's team, NYCU	2024 未來科技獎 2024 TIE Award
	儀科中心「高光譜顯微影像分析研發服務平台」服務成果：中央大學王智明教授團隊 Awarded through TIRI's R&D Service Platform for Hyperspectral Microscopic Imaging Analysis Platform:Prof. Chih-Ming Wang's team, NCU	2024 未來科技獎 2024 TIE Award
	儀科中心醫材學研團隊加值輔導服務成果：陽明交大黃奇英教授團隊 Awarded through TIRI's Medical Device R&D Value-added Service Platform: Prof. Chi-Ying Huang's team, NYCU	2024 未來科技獎 2024 TIE Award
第 21 屆國家新創獎 The 21th Annual National Innovation Awards	儀科中心與成功大學林志隆教授團隊 TIRI and Prof. Chih-Lung Lin's team from NCKU	新創精進獎 Innovative Improvement Award
	儀科中心與林口長庚醫院林承緯醫師團隊 TIRI and Dr. Cheng-Wei Lin's team from Linkou Chang-Gung Memorial Hospital	臨床新創獎 Clinical Innovation Award

競賽活動 Activities	得獎隊伍 Teams	獲獎項目 Prizes
第 25 屆 NHQA 國家醫療品質獎 The 25th National Healthcare Quality Award	儀科中心、嘉義長庚醫院及臺灣大學團隊 TIRI, Chiayi Chang Gung Memorial Hospital, and National Taiwan University Team	【傑出醫療類】 優選 Outstanding Clinical Service Excellence Award
台灣永續行動獎 Taiwan Sustainability Action Awards	儀科中心醫材學研團隊加值輔導服務成果： 雙和醫院曾健華醫師團隊 Awarded through TIRI's Medical Device R&D Value-added Service Platform: Dr. Chien-Hua Tseng's team, Shuang Ho Hospital	金獎 Gold Award
亞太永續行動獎 Asia-Pacific Sustainability Action Awards	儀科中心醫材學研團隊加值輔導服務成果： 雙和醫院曾健華醫師團隊 Awarded through TIRI's Medical Device R&D Value-added Service Platform: Dr. Chien-Hua Tseng's team, Shuang Ho Hospital	銀獎 Silver Award

推動前瞻科技
Advanced Technology Promotion



50 TIRI
璀璨五十、制勝未來

推動前瞻基礎建設－「前瞻半導體製程臨場檢測設備研發」計畫

Striving for Forward-Looking Infrastructure Development Program- "Advanced Research Instrumentation Development Service Platform" Project

儀科中心以累積多年的光電儀器研製以及光機系統整合經驗，參與第一期 (106 － 107) 與第二期 (108 － 109) 前瞻基礎建設計畫中的「自研自製高階儀器設備與服務平台」整合型計畫，主要建立國內半導體製程設備自製能力；110 年開始執行前瞻基礎建設－數位建設，第三期 (110 － 111)、第四期 (112 － 113) 與第五期 (114)「建置半導體臨場檢測設備計畫」以及「下世代半導體技術開發與人才培育」，首創 *in-situ* 製程量測，可在製程階段提供臨場檢測數據，協助國內半導體設備產業進入檢測設備自主開發，以及支援國內擴大半導體二維材料製程與設備跨領域半導體人才培育，吸引更多基礎科學物理、化學、數學領域人才加入半導體產業培育計畫，使國內廠商能佈局半導體檢測設備產業，落實整合國內半導體設備上中下游之技術，並將國內半導體設備能力再升級。

113 年主要成果如下：

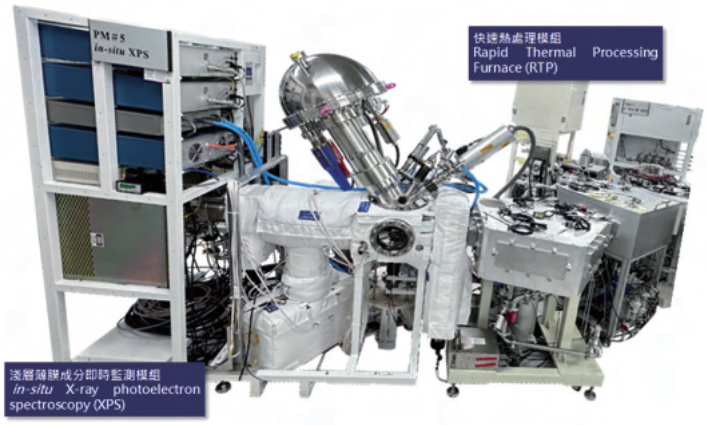
- 完成次奈米極淺層薄膜成分即時監測平台之快速升溫製程處理模組與 叢集式傳輸平台的對接以及傳輸測試，確認晶圓可正常傳輸後，同時搭配已建置完成的 *in-situ* XPS 模組進行了原子層沉積氧化鎢薄膜的硫化製程實驗與分析。
- 完成拉曼檢測模組與機邊 XRD 檢測薄膜材料 (厚度 < 1 nm) 之 WS_2 光譜訊號驗證，並獲得高解析之繞射訊號，後續進行二維材料晶體檢測與驗證，建立快速、非破壞性的檢測技術，解析半導體及下世代新穎材料的晶體結構、結晶取向等特性。

With significant experience in R&D and the integration of opto-electro-mechanical systems, TIRI has participated in the Advanced Research Instrumentation Development Service Platform integrated project: Phase 1 (2017–2018) and Phase 2 (2019–2020) of the Forward-Looking Infrastructure Development Program. It focuses on developing Taiwan's independent production capability for semiconductor processing equipment. In 2021, TIRI continued developing *in-situ* inspection semiconductor equipment and the next generation of semiconductor technology development and talent cultivation in Phase 3 (2021–2022), Phase 4 (2023–2024), and Phase 5 (2025) of the Forward-Looking Infrastructure Development Program—Digital Development. It initiated *in-situ* measurement and provided data during the process stage. TIRI assists in the domestic development of inspection equipment in Taiwan's semiconductor industry. It supports the expansion of interdisciplinary talent cultivation for 2D semiconductor material processes and equipment in Taiwan. This aims to attract more talents in basic science, physics, chemistry, and mathematics to participate in joint incubation plans for the semiconductor industry, enabling manufacturers in Taiwan to develop within the semiconductor inspection equipment industry. Thus, Taiwan's semiconductor equipment capabilities can be upgraded through the integration of upstream, midstream, and downstream technologies.

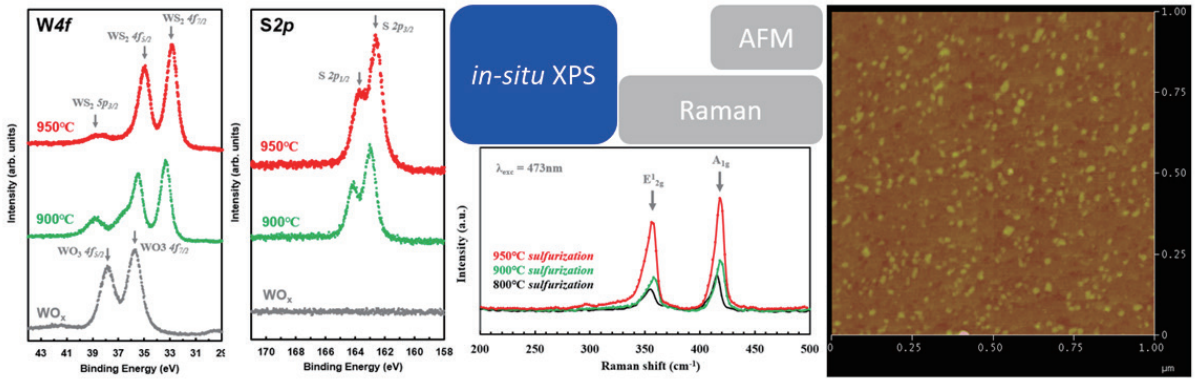
The main achievements for 2024 are as follows:

- TIRI completed the rapid heating process module docking with the clustered transmission platform for the sub-nanometer shallow film composition real-time monitoring platform and the transmission test. After confirming that the wafers can be normally transmitted, we conducted experiments and analysis on the sulfidation process of tungsten oxide thin films deposited by atomic layer deposition (ALD) using the established *in-situ* XPS module.

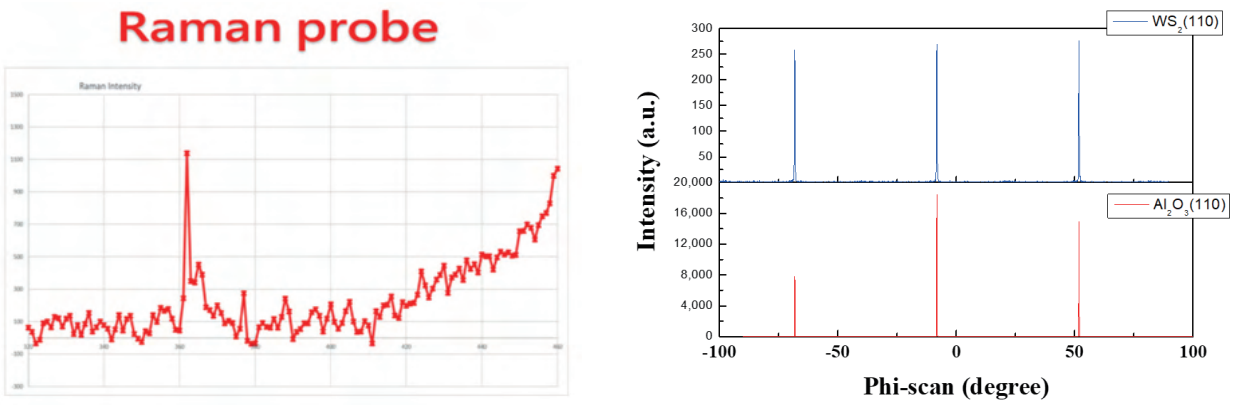
We validated WS_2 spectral signals between the Raman probe module and the inline XRD detection for thin film materials (thickness < 1 nm), obtaining high-resolution diffraction signals. Subsequently, crystal detection and validation of 2D materials were conducted, establishing a rapid, non-destructive detection technique to analyze the crystal structure, crystallographic orientation, and other characteristics of semiconductors and next-generation materials



極淺層薄膜成分即時分析平台
Real-time analysis platform of the composition of a very shallow film.



WO_3 薄膜硫化後分別進行 *in-situ* XPS、Raman 與 AFM 分析。
In-situ XPS, Raman, and AFM analysis of a WO_3 film after sulfidation.



左圖：WS_2 之拉曼臨場檢測光譜量測圖；右圖：WS_2 之 In-plane XRD 繞射圖。
Left: spectral measurement of Raman *in-situ* detection for WS_2. Right: on-plane XRD diffraction pattern of WS_2.

建置大面積二維材料製程 / 設備開發與服務平台

Establishment of the R&D Service for the Development of Large-Scale 2D Materials Process and Equipment

A世代計畫基於國內半導體二維材料製程與設備自主化，結合學界團隊共同發展未來半導體技術所需二維材料製程研發以及培育相關研究人才，藉此銜接台灣下世代半導體製程技術與設備之缺口，提升我國半導體產業競爭優勢。本計畫目標爲配合國家政策執行「A世代前瞻半導體技術」，並針對「關鍵半導體元件材料」進行大面積二維材料沉積設備與製程開發，以開發新穎低維半導體材料製程設備與技術爲基礎、開發關鍵元件技術與設備爲目標，期能透過挑戰物理極限的低維材料，爲下世代前瞻半導體設備與製程技術開啟新契機。

113 年主要成果如下：

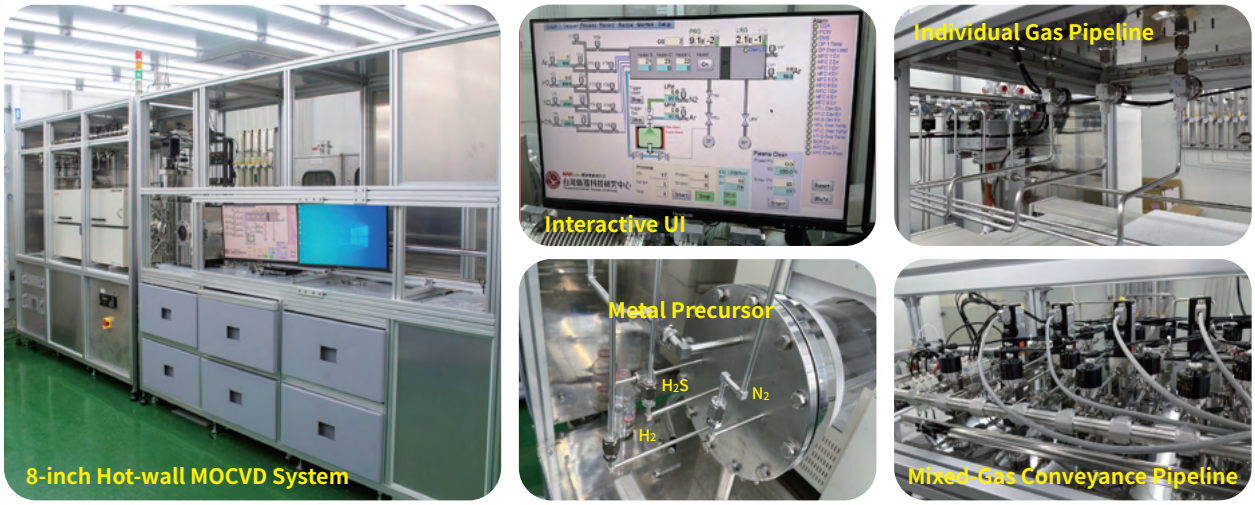
- 自主開發全氣態八吋 MOCVD 系統，使用者可藉由電腦介面變化製程參數與調整機構程式來操控製程程序，包含進氣管路具有分流與匯流選擇性搭配設計，且可調整晶圓載台角度，以利研究氣流與材料長成之關聯性。
- 透過本計畫團隊所研製之二維材料沉積製程與系統已可成長高品質 WS_2 晶體於 4-6 吋基板，且各項分析數據顯示皆符合國際文獻之材料特性，提供有潛力之學研單位進行先期材料基礎科學探討，進一步探索光學、機械、半導體、材料等各方面未突破之科學領域，以建立目前先進半導體製程中所需之技術，同時爲解決科學探索所研發之創新技術培育具冒險與創新的產業人才，並帶動新產業發展與提升世人的生活品質。

The Angstrom Semiconductor Initiative is based on Taiwan's semiconductor 2D material processes and equipment localization to jointly develop the 2D material processes required for future semiconductor technologies by collaborating with academic teams and cultivating relevant research talents. This initiative aims to bridge the gap in Taiwan's next-generation semiconductor process technology and equipment, enhancing the competitive advantage of Taiwan's semiconductor industry. The Initiative aligns with the national policy of implementing "angstrom advanced semiconductor technologies." It focuses on developing large-scale 2D material deposition equipment and processes for "key semiconductor component materials." With the foundation of developing innovative low-dimensional semiconductor material process equipment and technology and the objective of developing key component technologies and equipment, it aims to unlock new opportunities for next-generation forward-looking semiconductor equipment and process technologies through low-dimensional materials that challenge physical limits.

The main achievements for 2024 are as follows:

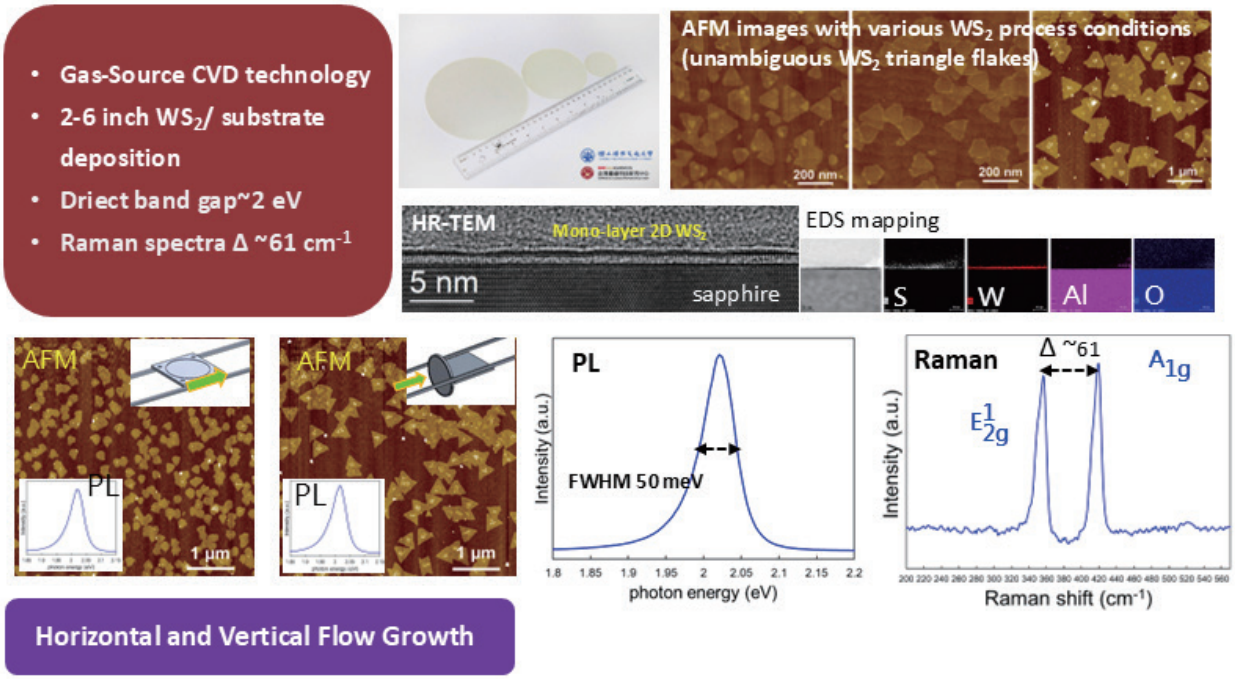
- TIRI has independently developed an all-gas 8-inch MOCVD system that enables users to control the process through a computer interface by altering process parameters and adjusting mechanical procedures. It includes the inlet piping of a selective design with options for splitting and merging flows. It also has a wafer chuck with an adjustable angle to facilitate the study of the correlation between gas flow and material growth.
- Through our team's 2D material deposition process and system, high-quality WS_2 crystals can now be grown on 4 to 6-inch substrates. Analysis indicates that the material properties align with international research. This can provide academic and research institutions with the potential for early-stage fundamental scientific exploration of materials. This allows them to explore uncharted scientific territories in optics, mechanics,

semiconductors, and various materials science fields, establishing the technologies required in current advanced semiconductor processes. It also cultivates adventurous and innovative industrial talents to develop new technologies for scientific exploration. It drives the development of new industries to enhance people's quality of life worldwide.



八吋 MOCVD 系統架構

The images above show the structure of the 8-inch MOCVD system.



八吋 MOCVD 系統架構所長成之二維材料進行量測分析，符合國際文獻所揭示之新穎材料特性。

The images show the measurement and analysis of the grown 2D material developed by the 8-inch MOCVD system, aligning with the novel material properties of the relevant international research.

建置智慧機械AI技術演練線上資料庫及AI落地驗證協作平台

Construction of an Online Database and Verification Platform for AI Intelligent Machinery Technology

本計畫建置AI技術演練線上資料庫及AI落地驗證協作平台提供學研界研究與驗證使用。AI技術線上資料庫除蒐集儀科中心產線數據外，亦可收納各學研團隊或智慧機械相關計畫之去識別化實驗數據，進而建構不同製程、設備、感測器等多型態資料庫，提供團隊針對不同需求使用對應資料庫進行專業人員訓練或團隊所開發之AI辨識器測試。技術落地驗證協作平台則提供設計、製造、組裝以及檢測相關軟硬體環境，讓需要驗證AI產品或技術之學研團隊進行異地驗證，以增加產品或技術強健性。

113年主要成果如下：

- 建構5種不同製程資料庫(精密轉台溫升變形、金屬銑削刀具磨耗、玻璃研磨品質、場域能源耗損與製程環境，以及加工設備切削液過濾設備異常監測系統)，累積數據資料達8.5 TB以上，包括加工製程感測器數據與相對應之量測結果可作爲機台健康診斷、品質預測、磨耗監測、模組測試驗證與製程優化。
- 於儀科中心光學元件產線佈建半導體中心開發之5G感測器，藉由5G麥克風於東台GT-630五軸智慧加工機的過濾泵浦及鍍膜設備的冷卻泵浦建置設備異常監測系統，已蒐集約11,000小時的有效聲音數據，並建立泵浦聲音訊號預測模型，預測準確度達0.99的R平方係數(R^2-score)以及3.1%的平均絕對百分比誤差(MAPE)，且透過監測系統即可有效進行異常訊號的監控及診斷，數據可分享學研單位應用，提升AI相關實作經驗。
- 建置AI多型態雲端資料庫架構，擴增內建五種演練範例與十種演算分析法，並開設3場AI雲端資料庫實作工作坊，內容包括人工智慧及AI分析模組基礎知識介紹、AI雲端資料庫模組及系統功能簡介並使用智慧機械聯網刀具磨耗、表面粗糙度數據資料作爲範例進行實作訓練，共計約120人次參加。

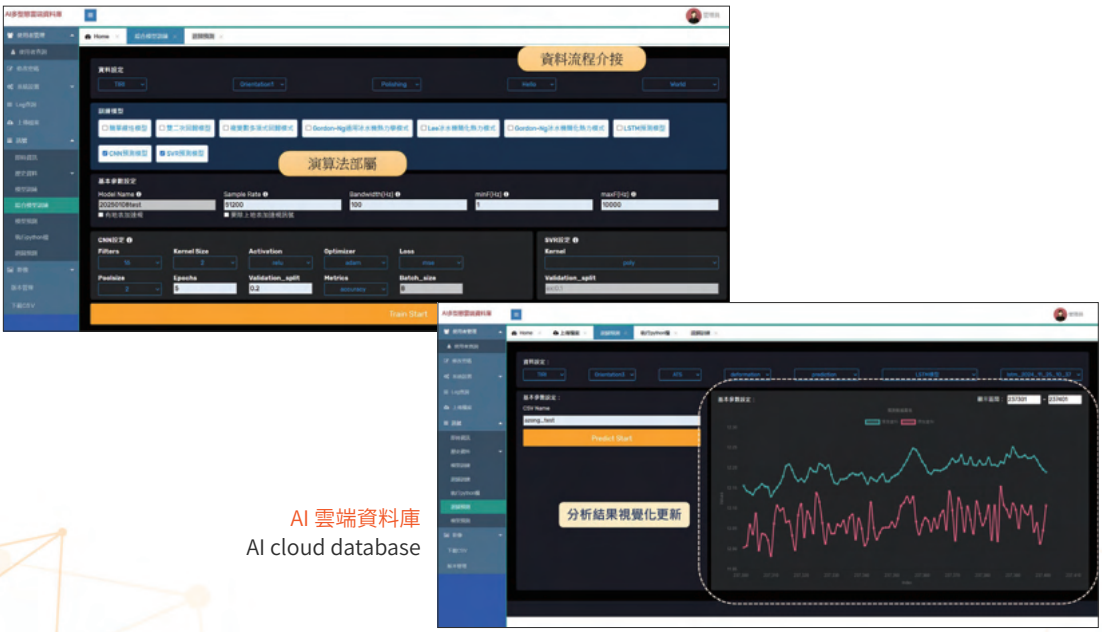
This project has established an online AI technical training database and a collaboration platform for AI technology verification. It facilitates R&D capabilities in academic and scientific communities. The online database not only collects TIRI's production line data but de-identifies experimental data from various academic research teams and intelligent machinery projects. This multi-type database, constructed using different processes, equipment, and sensors, is available to teams for specialized training or to develop AI-based classifiers per their requirements. The technology verification collaboration platform provides software and hardware environments for design, manufacturing, assembly, and testing. It enables academic research teams to verify AI products and technologies off-site, increasing the robustness of products or technologies.

The main achievements for 2024 are as follows:

- Five different process databases (thermal deformation of precision rotary table, tool wear condition prediction in milling, grinding quality prediction of quartz, field energy consumption and process environment, and monitoring system for abnormality in cutting fluid filtration equipment and processing equipment) were built. We have accumulated over 8.5 TB of data, including process sensor data and corresponding measurement results. This provides the basis for machine health diagnosis, quality prediction, wear monitoring, module testing, validation, verification, and process optimization.

- The 5G sensors developed by the Semiconductor Center at the optical module production line of Taiwan Instrument Research Institute were used to establish an equipment anomaly monitoring system for the filtration pump of the Tongtai GT-630 five-axis smart machining center and the cooling pump of the coating equipment. The system has collected approximately 11,000 hours of sound data. A pump sound signal prediction model has been established with an R-squared coefficient (R^2-score) of 0.99 for prediction accuracy and a Mean Absolute Percentage Error (MAPE) of 3.1%. The monitoring system detects and diagnoses abnormal signals. This data can be shared with academic and research institutions to enhance their practical experience in AI.
- TIRI also established an AI multimodal cloud database architecture, expanding with 5 built-in exercise examples and 10 computational analysis methods. Three AI cloud database practical workshops were held, covering basic knowledge of artificial intelligence and AI analysis modules, an introduction to AI cloud database modules and system functions, and practical training using intelligent machine-connected tool wear and surface roughness data as examples. There were over 120 participants!

AI 雲端資料庫實作工作坊訓練課程實況
AI cloud database practice workshop



AI 雲端資料庫
AI cloud database

建置智慧微塵感測器技術研發服務平台
Development of the Smart Dust Gas Sensor R&D Services

本計畫建構完善的智慧微塵感測器研發服務，提供感測器公板、感測器晶片與模組篩選、感測元件與模組驗證以及串接學研技術與產業鏈結，作爲學術界技術研發後盾，協助學界建立自主感測器技術能量。

113 年主要成果如下：

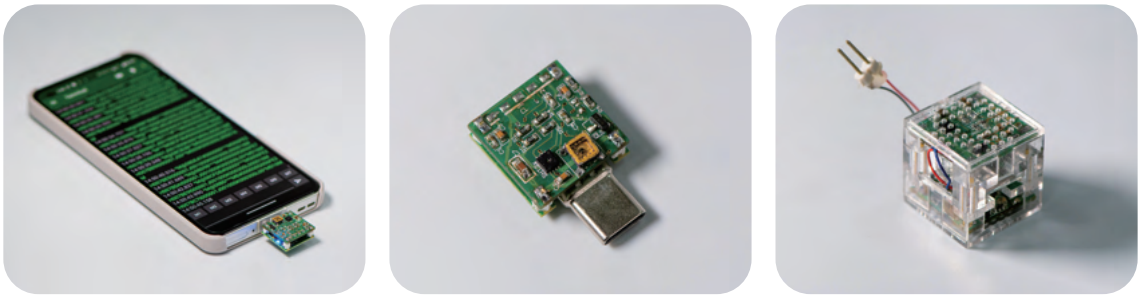
- 偕同國內類比晶片設計廠商，整合微處理器 (MCU)、訊號放大電路、運算等功能，完成第三代 (單一晶片、具即時溫 / 濕度補償功能、藍芽通訊與有線通訊) 氣體感測器元件公板模組開發與批量生產，體積爲 17 x 17 x 17 mm^3。
- 氣體感測器已進行 14 天長效穩定性與可靠度實測，完成連網測試及實驗室階段場域實測 (α-site)；並與工研院量測中心合作，完成氣體溯源第三方認證，以 10 ppm 濃度條件下 NO、SO_2、CO、H_2S，其驗證可追溯至國家度量衡標準實驗室與英國國家物理實驗室，並針對多樣態場域 (如空氣品質監測站、公共廁所、半導體廠房以及汙水處理廠) 進行感測器佈點，與國際標竿感測器進行量測數據平行比對與精進技術規格 (β-site)。
- 感測器技術研發服務平台輔導學研團隊國立高雄科技大學蕭育仁教授關鍵技術落地應用，申請經濟部科研成果價值創造計畫「下世代低功耗與高靈敏微型感測器產品設計開發計畫」，已通過並獲補助新台幣一千五百萬元。

This project developed a complete smart dust gas sensor R&D service platform providing customer reference board (CRB), sensor chip and module screening, device and module verification, and the industry-university collaboration matching. The platform serves as R&D support for the university community in realizing the technical capabilities of autonomous sensors.

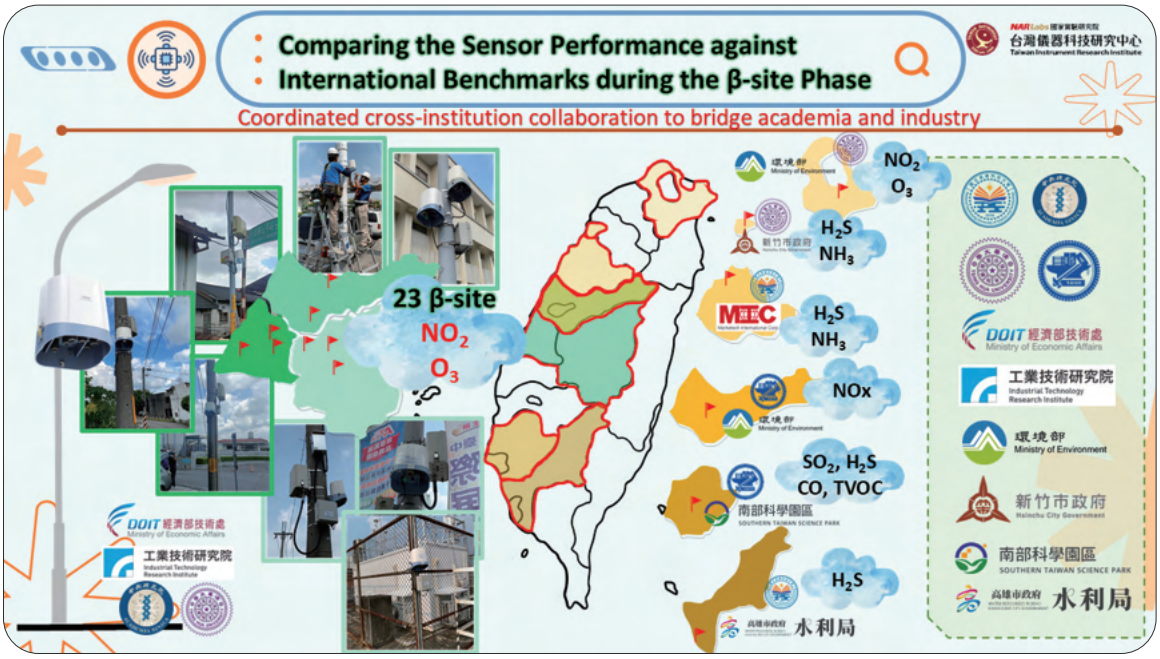
The main achievements for 2024 are as follows:

- TIRI collaborated with domestic analog chip design manufactures in developing integrated microprocessors (MCU), signal amplification circuits, computation and other functions to complete the development and mass production of the third generation (single chip with real-time temperature/humidity compensation function, Bluetooth and wired communication) of the gas sensor component CRB modules, with the dimensions of 17 x 17 x 17 mm^3.
- The gas sensor underwent 14-day long-term stability and reliability testing and completed networking and field tests in the laboratory stage (α-site). Collaborating with the Measurement Center of the Industrial Technology Research Institute, TIRI has achieved third-party certification for gas traceability. The verification, conducted under conditions of 10 ppm concentration for NO, SO_2, CO, and H_2S, is traceable to the National Measurement Laboratory R.O.C. and the National Physical Laboratory in the UK. We performed sensor deployment in various environments (such as air quality monitoring stations, public restrooms, semiconductor factories, and wastewater treatment plants) for parallel comparison of the measurement data with international benchmark sensors and the refinement of technical specifications (β-site).
- The Sensor Technology Research and Development Service Platform guides the academic and research team led by Professor Yu-Jen Hsiao from the National Kaohsiung University

of Science and Technology in the practical application of key technologies. An application for the "Next-Generation Low-Power and High-Sensitivity Micro-Sensor Product Design and Development Plan" under the Ministry of Economic Affairs' Research and Development Value Creation Program has been approved and granted a subsidy of NTD 15 million.



具即時溫/濕度補償功能、藍牙通訊與有線通訊氣體感測器元件公板模組
Gas sensor component CRB modules with real-time temperature/humidity compensation function, Bluetooth, and wired communication.



智慧微塵感測器 (β-site) 場域實測
Field test of smart dust gas sensor (β-site)

建置器官晶片最適化服務平台
Constructing a Service Platform for Organ-on-a-Chip Optimization

因應替代動物科技試驗 (Alternative Animal Testing) 的國際發展趨勢，本計畫建構器官晶片最適化服務流程與器官晶片試生產及製程標準化平台，協助器官晶片從概念到實際應用規格的工程解決方案，確保產品的功能性、可用性和合規性。本平台係以國研院一站式生醫科技服務平台爲重要的基礎核心，擴展應用服務至替代動物科技試驗範疇。

113 年主要成果如下：

- 提供學研團隊器官晶片開發階段所需核心技術服務，並建置器官晶片試生產及製程標準化平台，完成器官晶片氣體及氣體驅動時的流量穩定性與洩漏測試系統建置，氣體測試流量範圍在 0.02 ~ 2000 cc/min，確保氣體壓力與流量的穩定性；液體測試流量範圍 0.1 ~ 1500 ml/hr，並可進行長時間 (24 小時) 的洩漏測試及穩定性測試；完成射出成型機之設備安裝、定位試製

及人員操作教育訓練，並針對聚碳酸酯 (Polycarbonate, PC) 及聚丙烯 (Polypropylene, PP) 的材料建立系統參數，將可協助團隊進行小批次量產。

- 建構器官晶片驗證場域之品質系統導入服務，針對器官晶片測試方法，規劃驗證場域，盤點所需之設備及測試驗證項目，依循 ISO 17025 架構，協助研究團隊建構完善的標準流程、稽核機制，以提升器官晶片的測試可靠性與產業化可能性。本項品質系統導入服務已實際運用於研發團隊，並協助建立器官晶片水凝膠填充標準化流程操作指導書，可縮短器官晶片填充水凝膠 20% 製備時間。
- 籌組替代科技產學聯盟，盤點器官晶片上下游產業鏈結構，包含材料 (如：PDMS、PC、PMMA、Glass、Silicon)、晶片訊號、射出製造、模具、包材、封合等領域，並鏈結晶片安全性確效及製造量產機構，協助學研團隊進行批次量產製造。同時接洽藥廠評估參與聯盟的可行性，以使產學聯盟架構銜接後端使用者。

In response to the international development trend of Alternatives to Animal Testing, we built a platform for the service flow of organ-on-a-chip optimization and standardization of organ chip pilot production and manufacturing processes. It assists in engineering solutions for organ chips from concept to actual application specifications. This platform is based on the NARLabs one-stop biomedical technology service platform, serving as a foundation to extend the application services to Alternative Animal Testing.

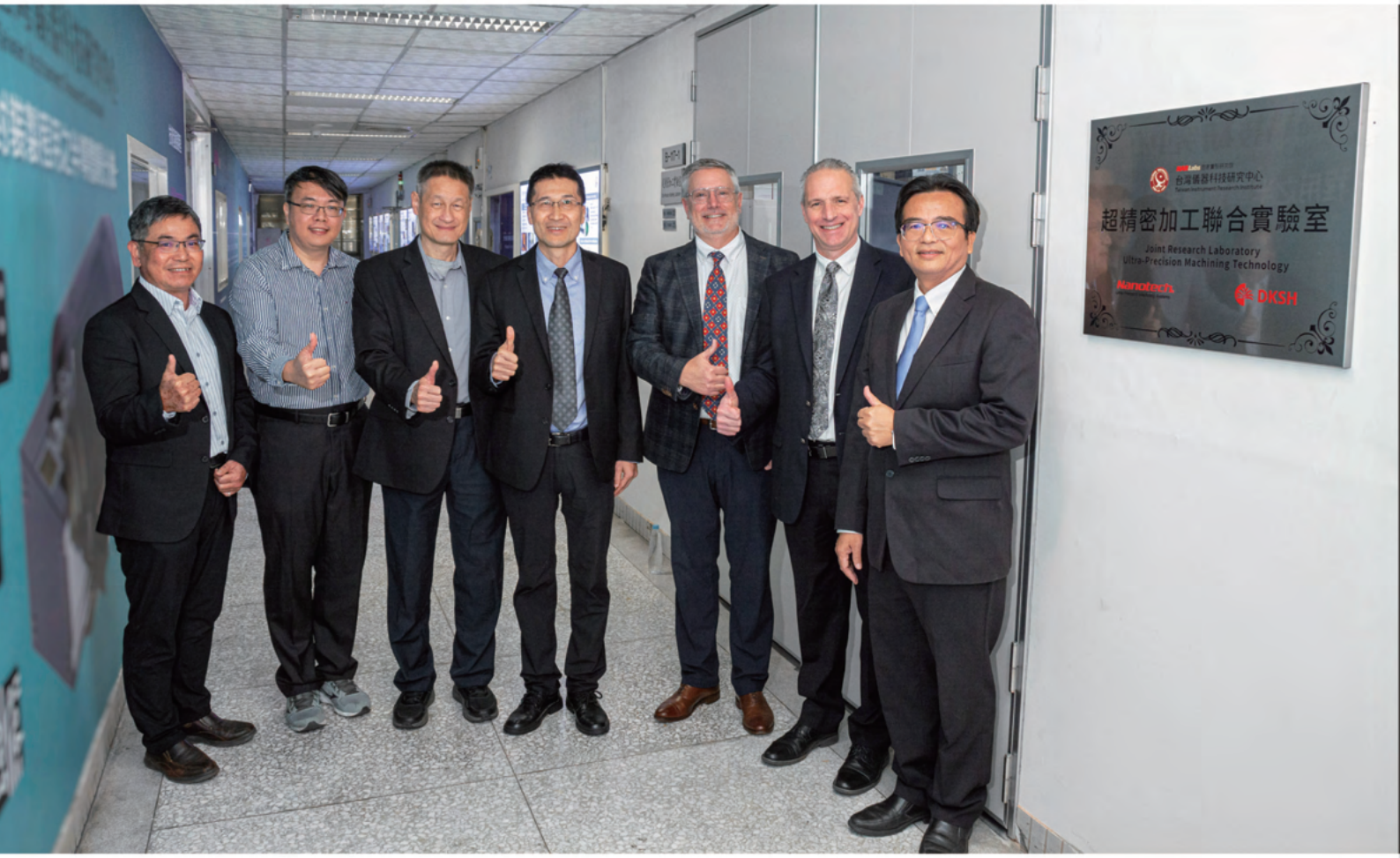
The main achievements for 2024 are as follows:

- TIRI has provided core technical services required by the academic and research team during the development stage of the organ-on-a-chip and established a platform for organ-on-a-chip pilot production and process standardization. A system for testing the flow stability and leakage of gases and liquid-driven flows in organ-on-a-chip has been completed, with a gas test flow range of 0.02 to 2000 cc/min to ensure stability in gas pressure and flow. The liquid test flow range is 0.1 to 1500 ml/hr, and the system can conduct long-term (24-hour) leakage and stability tests. Installation of injection molding machines, positioning trials, and operator training have all been completed. System parameters have been established for polycarbonate (PC) and polypropylene (PP) materials, assisting the team in small-batch production.

  TIRI offers quality system implementation services for organ-on-a-chip validation environments. We planned the validation environment, checked the required equipment, and tested validation items for organ-on-a-chip testing methods. We also assisted the research team in establishing a comprehensive standard process and audit mechanism following the ISO 17025 framework. This enhances the test reliability and industrialization potential of the organ-on-a-chip. R&D teams have practically applied this system implementation service. It has helped establish a standardized operating procedure for organ-on-a-chip hydrogel filling, which may reduce the preparation time by 20%.

- TIRI has organized an industry-academia alliance for alternative technologies. It inventoried the upstream and downstream industrial chain structure of the organ-on-a-chip, including materials (PDMS, PC, PMMA, Glass, and Silicon), chip signals, injection molding, molds, packaging materials, sealing, and other fields. By building connections with institutions for chip safety verification and mass production, we assist the academic and research teams in batch production and manufacturing. TIRI has also approached pharmaceutical companies to assess the feasibility of their participation in the alliance, aiming to connect the industry-academia alliance structure with end-users.

國際合作
International Cooperation



儀科中心長期發展光學與眞空技術，在國內已建立領先地位，爲促成中心成爲「國際級儀器科技研發整合卓越中心」，積極推動國際合作，除派員參加國際研討會及展覽，參訪國際組織之外，同時邀請國際知名學者及優秀人士至儀科中心參訪或進行授課及訓練課程，擴大國際技術交流層面與管道，維持與國際儀器科技社群交流與互動，以培育優秀儀器研發人才，提升儀科中心研究水準。

TIRI has been known as a pioneer and leading hub of vacuum and optics technology in Taiwan. Targeting to be an international integrated R&D instrument technology institute, TIRI is dedicated to promoting international collaboration. To increase its global reputation, TIRI actively participates in international conferences/exhibitions and visits international organizations. Meanwhile, internationally renowned scholars and outstanding professionals are also invited to visit TIRI. This year TIRI continuously interacts with partners via multiple access. It has always been TIRI's pursuit to keep interaction with global instrumentation societies, cultivate excellent R&D talents, and advance R&D level.

荷蘭半導體及光電領域的產官學研訪團至儀科中心參訪交流
Netherlands PIC (Photonics Integrated Circuits) Innovation Delegations visit TIRI for possible collaboration.

「臺越雙邊科技合作交流會議」參訪團成員與中心研究人員交流，洽談未來可能合作契機。
Vietnam MOST government officials and professors who participate in the Bilateral Science and Technology Cooperation activities visit TIRI for possible future collaborative opportunities.

國際學研產合作夥伴
International Partners in Academia, Industry, and Research Organization

國研院以推動國際化、打造世界級實驗室爲宗旨，儀科中心積極向外推廣技術能量，與世界各國學、研、產單位接軌，提升國際知名度。近年來與中心核心技術領域之重點國際學研產單位維繫良好合作關係，透過專案委託及共同研究方式進行實質合作交流。

One of the missions carried by NARLabs is to establish a global and world-class R&D service platform. TIRI actively promotes R&D capabilities to cooperate with industry, academia and research institutions in countries around the world to enhance its international visibility. Targeting to the significant universities, companies and research organizations related to its core technologies, TIRI is conducting preliminary-stage commissioned projects and joint research with these international partners, and expects to establish a foundation for formal cooperation.

合作單位 Cooperating Unit	合作題目 Subject of Cooperation
日本獨立行政法人理化學研究所 RIKEN, Japan	可控輻射角度之三維裂環共振器的研究 Manipulation on radiation angles via spatially organized multipoles with vertical split-ring resonators
捷克科學院物理研究所 Institute of Physics, Academy of Science (FZU), Czech Republic	ALD 奈米疊層技術製備用於 NiTi 支架之高抗斷裂性 TiO_2/Pt 保護膜 Fracture-resistant TiO_2/Pt composite protective coating on NiTi stent by ALD nanolamination ALD 沉積高覆蓋保護層用於提升 NiTi 合金支架生物相容性 Atomic layer deposited TiO_2 and Al_2O_3 coatings on NiTi alloy
泰國國家科學院金屬與材料科技中心 National Metal and Materials Technology Center, National Science and Technology Development Agency (NSTDA-MTEC), Thailand	有機毒物感測器 Disposable electrodes for portable pesticide sensors (DEPPS)
立陶宛國家物理科學技術中心 Center for Physical Sciences and Technology (FTMC), Lithuania	以雷射微加工製程開發氮化鎵與氧化鎵功率元件無光罩綠色技術之研發 Maskless green technologies of GaN and Ga_2O_3 power devices by laser micro-processing
美國穆爾集團奈米技術公司 Moore Nanotechnology Systems LLC. (Nanotech), USA	超精密加工合作研究及人才培育 Joint research and talent cultivation on ultra-precision machining technology

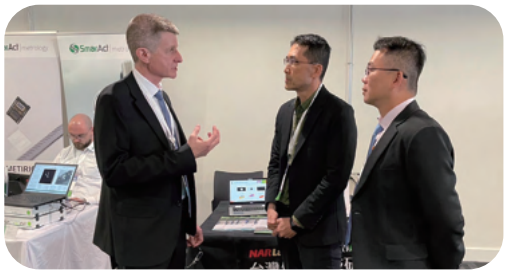
儀科中心「超精密加工聯合實驗室」正式啟動，美國穆爾集團奈米技術公司協助設備建置維護與技術支援，未來將以此實驗室推動超精密加工之合作研究與人才培育。
TIRI officially launches the Joint Research Laboratory for Ultra-Precision Machining Technology with Nanotech, targeting to promote research collaboration and talent cultivation.

泰國國家科學院金屬與材料科技中心至儀科中心洽談臺泰雙邊計畫，未來將著重於重金屬毒物感測技術領域。
TIRI collaborates with NTHU and NSTDA-MTEC from Thailand for the NSTDA-NARLabs Joint Research Program (JRP), focusing on the research of the electrochemical heavy metal sensor technology.

參與國際社群組織運作
Involvement in the International Society

爲將技術能量推廣至國際，儀科中心積極利用受邀國際會議發表論文或演說機會，以及參與**臺灣國際半導體展**、**德國法蘭克福國際光學暨雷射科技展**、及**美國 SPIE 國際光電展**等國際指標性展覽，展示核心技術與客製服務成果，提高國際能見度並爭取國際合作案。

另一方面，儀科中心積極參與國際儀器科技組織，以強化國際鏈結與組織地位重要性，協助我國儀器專業躍升於國際舞台。除了積極參與各科技社群，如**美國機械工程師學會台灣分會**、**美國眞空學會台灣分會**、**國際半導體產業協會台灣分會檢測與計量委員會 (SEMI Taiwan Inspection & Metrology Committee)** 等國際組織之會務活動，儀科中心亦藉由成立儀器科技國際學會及組織學會活動的方式，提昇在儀器科技領域的知名度與領航地位。自 98 年成立**國際電機電子工程師學會儀器工程與量測科技學會 (IEEE IMS) 中華民國臺北支會**以來，持續耕耘學會活動，參與學會旗艦型年度會議，以專文發表中心及臺灣儀器科技領域研發能量綜覽文章。同時，儀科中心每年受邀參加學會全球支會主席高峰會議 (IMS Chapter Chair Summit)，簡報臺灣當前儀器工程與量測科技之發展，有效拓展臺灣學者往後於全球推動儀器及量測科技發展及制定標準等方面之影響力。



儀科中心參加IEEE IMS年度旗艦型國際研討會IEEE International Instrumentation and Measurement Technology Conference (I^2MTC)，參與學會核心議題討論並推廣中心技術服務。

TIRI researchers participate in the IEEE International Instrumentation and Measurement Technology Conference (I^2MTC), the annually flagship conference of IEEE IMS, and make oral presentation on the latest research results, promoting TIRI's capability and service.

加拿大渥太華大學電機資訊學院兼任探索實驗室主任 Shervin Shirmohammadi 教授，同時擔任 IEEE IMS 學會執行副會長，其參訪中心給予專題演講，並與 IMS 臺北支會成員深入交流，討論學術領域及學會推廣事宜。

Prof. Shervin Shirmohammadi is a Professor in the School of Electrical Engineering and Computer Science (EECS) at University of Ottawa, Canada. He is also the Director of Discover Laboratory at uOttawa. As the current Executive Vice President of IEEE IMS, Prof. Shirmohammadi is invited to TIRI and shares his expertise with researchers while having a great discussion on society management and promotion with IMS Taipei Chapter members during his visit.

In order to build up the global reputation of technical capability, TIRI takes advantage of every opportunity to publish research papers and deliver speeches at the invited international conferences. TIRI participates in the annual international exhibitions such as **SEMICON Taiwan, Optatec Trade Fair Frankfurt,** and **SPIE Photonics West** to display core technologies and customized services, to improve international visibility and strive for international cooperation projects.

On the other hand, TIRI actively participates in the international instrument technology organizations, including **American Society of Mechanical Engineers (ASME) Taiwan Section, American Vacuum Society (AVS) Taiwan Chapter,** and **SEMI Taiwan Inspection & Metrology Committee**, aiming to strengthen the global connections and enhance our international reputation.

Furthermore, TIRI has gradually established the leading position in the field of instrumentation technology through the strategy of initiating the international instrumentation technology society chapter and organizing society activities. Since 2009, **IEEE Instrumentation and Measurement Society (IMS) Taipei Chapter** was established under the support of TIRI and domestic academia. Every year, TIRI researchers actively participate in the society activities to attend the annual flagship conference of the society, and present the R&D developments and capabilities of TIRI and Taiwan. It is benefit to increase domestic scholars' influence on the promotion of instrumentation, measurement, standard formulation and so forth.

技術服務
Technical Services

儀器系統開發及關鍵元組件委託研究與委製服務
Commissioned Research and Manufacturing Service for Advanced Instrument and Key Component

除了自主儀器技術的開發，儀科中心秉持支援學術研究、服務產業界為宗旨，提供眞空、光學、光機相關儀器及關鍵零組件之委研、委製、校測等技術服務，113 年提供產學研各界檢測與委製服務累計共 2,040 件，接受各界委託，運用儀器科技協助進行前瞻研究並解決產業問題。

Not only has TIRI constantly developed its own instrumentation technologies, but also in compliance with the goal of supporting academic research and serving industry professionals, TIRI provides OEM and calibration services for vacuum equipment, optical systems, and key components. In 2024 TIRI provides a total of 2,040 testing and OEM services to enterprises, universities and research institutes. TIRI is commissioned by various industries to conduct frontier research and solve problems with its advantages in the field.

(1) 學界委託計畫 Commissioned Research Projects from Academia

支援學術前瞻研究，推動國家科技發展，透過長年與國內各大專院校的研發合作，儀科中心是臺灣學術界的最佳夥伴與技術支援。113 年學界合約案件數衆多，僅列舉部分於下。

Supporting academic research, promoting national technology development, and conducting long-term R&D cooperation with domestic universities have made TIRI the best ally and driving force for academia in Taiwan. There are a lot of projects for academia in 2024, only some of whom are listed below.

計畫名稱 Project Title	合作對象 Partner
A 世代半導體專案計畫 Angstrom Semiconductor Initiative Project	國立清華大學、國立陽明交通大學、國立中央大學、長庚大學，4校共計 7 個研究團隊共同參與計畫。 7 research teams from 4 universities, including NTHU, NYCU, NCU, and CGU, are joint in this project.
智慧微塵感測器技術研發服務平台專案計畫 Smart Dust Sensor Technology and Development Service Platform Project	國立清華大學、國立陽明交通大學、國立高雄科技大學，3 校共計 6 個研究團隊共同參與計畫。 6 research teams from 3 universities, including NTHU, NYCU, and NKUST, join in this project.
發展智慧製造及半導體先進製程資安實測場域專案計畫 IoT Information Security Development Project for Intelligent Manufacturing and Semiconductor Processing Testing Field	國立臺灣大學、國立臺灣科技大學、國立成功大學、國立中興大學、國立中正大學、國立勤益科技大學、中原大學、南臺科技大學，8 校共計 6 個研究團隊共同參與計畫。 6 research teams from 8 universities, including NTU, NTUST, NCKU, NCHU, CCU, NCUT, CYCU and STUST, participate in this project.
立方衛星用遙測光學模組開發 Optical R&D for Remote Sensing Imager on Cube Satellite	國立成功大學 National Cheng Kung University

計畫名稱 Project Title	合作對象 Partner
高眞空濺鍍系統 High Vacuum Sputter System	國立中興大學 National Chung Hsing University
6 吋眞空快速加熱爐及電漿處理系統開發 6-inch Vacuum Heat Treatment and Plasma Furnace System	中央研究院 Academia Sinica

(2) 產業界委託計畫 Commissioned Research Projects from Industry

儀科中心以驅動儀器設備在地化爲使命，積極擴散研發能量，鼓勵中心研發團隊解決產業界需求，透過橋接學界與業界，以產學合作方式，促使國家產業技術升級，並厚植及深根國內儀器技術。113 年產界合約案件數繁多，僅列舉部分於下。

Aiming to localize the instrumentation technology, TIRI promotes its R&D capability actively and encourages its teams to respond to the industrial demands. Through industry-academia-research cooperation, TIRI is capable of bridging universities, institutes and industries, and thus promoting the domestic industry upgrading and instrumentation technology developing. There are a lot of industrial projects in 2024, only some of whom are listed below.

委託計畫 Project Title

- 微流體與生醫晶片整合技術
  Technology of Integrating Micro Fluidic and Bio-medical Chip
- 精密光學元件開發製作
  OEM of Precision Optical Components
- 原子層沉積 / 蝕刻系統委製案
  Atomic Layer Deposition / Etching System OEM Project
- 生醫產品開發及驗證
  R&D and Verification Service of Bio-medical Products
- 自動光學檢測及分類技術
  Automated Optical Inspection (AOI) and Sorting Technology

TAF 認證實驗室的校正與測試服務
ISO/IEC 17025 Calibration Laboratory

儀科中心建置並持續維持 TAF 認證實驗室，提供眞空標準的校正與光電檢校測試服務，服務對象包含產、官、學、研各界，每年提供逾百件認可校正報告服務。

儀科中心所提供的 TAF 校正與測試服務項目詳列於儀科中心官網：https://www.tiri.narl.org.tw/Service/Taf，動態更新相關檢校項目。

TIRI has established and kept maintaining ISO/IEC 17025 Calibration Laboratories to provide standard vacuum calibration, and optoelectronic inspection and testing services with more than 100 recognized calibration reports annually. The ISO/IEC 17025 calibration and testing service items are shown on TIRI website: https://www.tiri.narl.org.tw/Service/Taf.

人才培育
Talent Cultivation

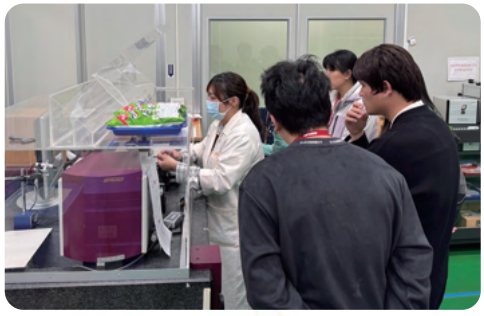
配合國科會政策辦理各項科普活動，推廣儀器科技科普知識。
In alignment with NSTC policy, TIRI hosted various popular science activities to promote instrumentation and technology for young generation.

儀科中心致力培育我國儀器研發高階人才，因應內外部環境變動與競爭，拓展更多元之人力資源運用方式包括提供優秀博士生獎助金方案，與學界共同指導碩博士研發前瞻設備、開放研究生參與研究計畫及國研院暑期實習生培訓計畫，並自107 年起執行「重點產業高階人才培訓與就業計畫」，培訓博士級產業訓儲精英，進入企業實習機會，並媒合高階人才就業成功或創業，促成跨領域整合研究與培育儀器科技人才；舉辦學生儀器競賽、科普活動以及提供教學參訪行程等，落實科研教育向下扎根；以演講或短期訓練講座方式，積極參與學研界活動；出版《科儀新知》儀器技術專業期刊以達知識擴散之目標。

儀科中心透過開辦各種專業研訓課程與研討會，培育國家科研基礎人才的質與量，厚植高科技產業技術人才。113 年舉辦的研習班與研討會包括「眞空技術研討會」、「儀器技術訓練」、「半導體設備原子級薄膜製程技術交流會」、「半導體設備與製程技術種子教師系列研習課程」等，並開設多場重點產業高階人才培訓課程，有助於提升產業的競爭力、推動科技創新和促進國家的發展。

TIRI has multiple channels to cultivate outstanding professional talents for domestic academia in instrument-oriented field. First of all, TIRI opens **research program for graduates, NARLabs Internships Program** for master and Ph.D. students, and "**Rebuild After PhD's Industrial Skill & Expertise (RAISE) Project**" (since 2018) for research manpower required by high-tech industry in order to enhance the quality and quantity of talents as the foundation for scientific research of our country. Second, TIRI launches student instrument competitions and popular science activities while opening for teaching-oriented visiting requests for young talents. Furthermore, TIRI hosts professional training workshops and seminars to engage with the academia, and also publishes the "Instruments Today" professional journal to achieve the goal of knowledge dissemination.

There are many workshops and seminars organized in 2024, including "Workshop on Practical Vacuum Technology", "Instrument Training Course", "ALD/ALE Equipment Development Workshop", and "Teacher Training Course for Semiconductor Manufacturing Process & Equipment". What's more, TIRI opened multiple major training courses for high level industrial professional cultivation. TIRI has shown the strong capability in high-tech talent cultivation, which contributes to the enhancement of domestic industry competitiveness and the advancement of national technological innovation.



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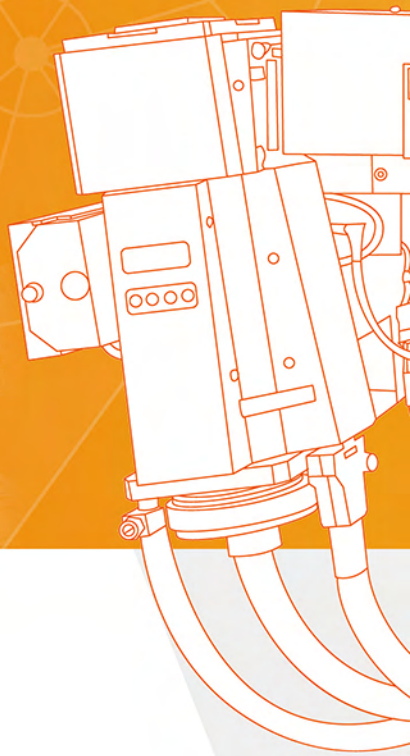

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