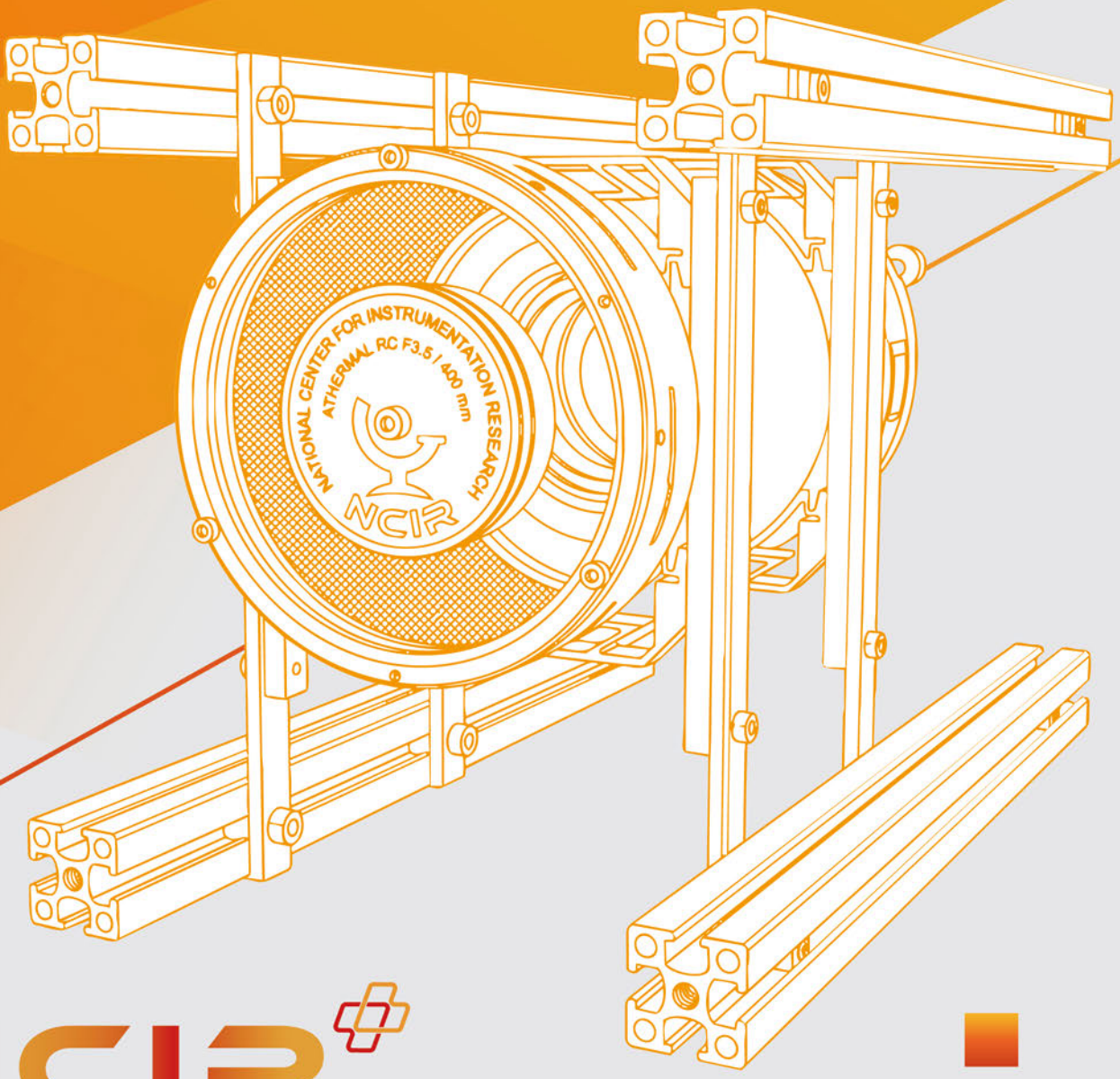
114 年報 | 國研院 國儀中心

2025 ANNUAL REPORT



NCIR

2025 ANNUAL REPORT

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Message from Director General

主任的話

國儀中心配合政府國家希望工程以及國科會施政目標，積極落實國研院賦予的四個核心任務「建構研發平台、支援學術研究、推動前瞻科技、培育科技人才」，為突顯本中心是以研究導向的國家級單位，能更有效率推動國家任務與政策，於 114 年 3 月 25 日正式更名為「**國家儀器科技研究中心**」，以儀器科技繁盛國家研發實力為使命，持續完備世界級儀器研發與育才服務平台，致力於推動前沿跨領域儀器技術，確保我國先進儀器技術永續精進。

國儀中心聚焦於「**光學**」與「**真空**」專業領域，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**」、「**智慧傳動與生醫光電技術服務平台**」等技術服務平台，精進核心關鍵技術以力挺學界開創前瞻的學術研究成果，增進民生福祉與產業應用。國儀中心與陽明交通大學 (陽明交大) 合作，成功開發「自動化幹細胞培養與分化系統 Cyto Chamber (先鋒一號)」，並在日本諾貝爾醫學獎得主山中伸彌創立的 CiRA 基金會年度論壇，動態展示此部世界首創的系統，獲得各界高度肯定與關注。該系統透過自動化取代大量人力繁瑣步驟，實現高效率幹細胞培養與分化，引領臺灣在再生醫學的研製能量朝產業化邁進；國儀中心開發特規激發光顯微物鏡，整合至中央研究院團隊之貝索層光顯微鏡，力助開發層光奈米顯微術，將果蠅腦組織放大 6.4 萬倍，可清晰辨識果蠅腦神經細胞間極為細微的突觸結構，支援團隊將研究成果發表於國際知名期刊《*Nature Communications*》；國儀中心協助陽明交大與振興醫院開發超微型光纖麥克風關鍵薄膜製程與檢測，成功研製微米級光纖麥克風，拓展光聲成像與醫學應用潛力。

國儀中心提升自主前瞻遙測光學系統整合與精密光學元件關鍵技術及服務能量，累積 50 年光學設計與鏡片製作經驗，為國內少數能製作大口徑非球面鏡太空衛星鏡片之研發單位，支持國家太空計畫任務與太空產業發展，自福爾摩沙衛星二號起，參與福衛五號與福衛八號主、次鏡研製，再到低軌道立方衛星「百合 II (Telescope of Lilium II)」的遙測鏡頭設計與開發，打造讓臺灣衛星「看得更清楚、看得更遠」的高解析光學系統。

同時，國儀中心提供真空與光機電整合技術服務，與產、學、研、醫密切合作，囊括「國家新創獎」、「未來科技獎」、「計量科技研發創意獎」、「IIIC 國際創新發明競賽」、「Park Systems Nano Image Challenge 2025」，以及「國家實驗研究院傑出科技貢獻獎」共 10 個獎項肯定！此外，為協助產業突破傳統碳化矽研磨技術瓶頸，國儀中心與鼎極科技股份有限公司共同開發「紅外線奈秒雷射應用於碳化矽晶圓乾式研磨製程」，晶圓破片率可降至 1%，加工速度可提升約 30%，有效提升碳化矽晶圓研磨速率與品質，回應高效能功率元件的產業需求。

國儀中心亦積極拓展國際合作，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國儀中心參訪或進行演講及訓練課程，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關係；國儀中心長期耕耘國際重要儀器科技社群組織國際電機電子工程師學會儀器工程與量測科技學會 (IEEE Instrumentation and Measurement Society, IEEE IMS) 及營運其臺北支會，在 IEEE IMS 臺北支會推薦下，第 16 屆 *i*-ONE 專上組首獎團隊 (清華大學) 赴德國參加 2025 IEEE IMS 國際學生競賽，榮獲第二名佳績，展現出臺灣學子於創新儀器的科研實力，也發揮國儀中心影響力，為我國優秀青年學子爭取更多國際舞台。

面對全球科技競逐與 AI 轉型浪潮，國儀中心將持續以核心技術為基石、科技創新為動力，建構具國際影響力之科研服務平台，橋接學界研發創意與產業需求，與產官學共同攜手提升臺灣儀器設備自主化的能量，帶動產業發展與提升世人的生活品質，達成「創新科技，守護臺灣」的目標。

Aligning with the government's National Project of Hope and the national science and technology development policies of the National Science and Technology Council (NSTC), the **National Center for Instrumentation Research (NCIR)**— formerly the Taiwan Instrument Research Institute (TIRI) — actively carries out the four core missions of the National Institutes of Applied Research (NIAR): (1) establish R&D platforms, (2) support academic research,

(3) promote frontier science and technology, and (4) foster high-tech talent. To reinforce our role as a research-driven national-level institution capable of more promoting national missions and policies, TIRI was officially renamed **NCIR** on March 25, 2025. With a mission to enhance Taiwan's R&D capabilities in instrumentation, NCIR continues to develop world-class research and talent development platforms. We are committed to advancing cutting-edge and interdisciplinary instrumentation technologies to support Taiwan's long-term, sustainable development.

NCIR focuses on the specialized areas of **precision optics** and **vacuum coating and equipment**, and has established several technical service platforms, including the **Localization Platform for Semiconductor Process Equipment and Materials**, the **R&D Hub for Academia Collaboration, National Defense, and Spaceborne Remoting Sensing Systems**, and the **Promotion Platform for Intelligent Automation and Biomedical Optoelectronics Technology**. By advancing key technologies, NCIR supports academic innovation in frontier research to strengthen public well-being and facilitate industrial applications. In collaboration with National Yang Ming Chiao Tung University (NYCU), NCIR developed the Automated Stem Cell Cultivation System Cyto Chamber (Pioneer 1). Widely recognized across sectors, this world-first system was presented at the annual forum of the CiRA Foundation in Japan, a foundation established by Nobel laureate Shinya Yamanaka. By automating numerous labor-intensive processes, the system enables highly efficient stem cell culture and differentiation, helping drive the industrialization of Taiwan's regenerative medicine research. Furthermore, NCIR has developed a customized excitation objective lens integrated into a Bessel beam light-sheet microscope developed by the Academia Sinica research team, making significant contribution to advances in light-sheet nanoscopy. This technology enables imaging of fruit fly brain tissue at magnifications of up to 64,000×, allowing clear visualization of ultra-fine synaptic structures between neurons, and supporting the team's publication of their findings in the internationally renowned journal *Nature Communications*. NCIR has also assisted NYCU and Cheng Hsin General Hospital in developing key thin film processes and validating ultra-micro optical fiber microphones. This work has enabled the fabrication of micron-scale optical fiber microphones, advancing photoacoustic imaging and expanding its potential for medical applications.

NCIR also enhances capabilities in integrating independently developed advanced remote sensing optical systems, along with key technologies and services for precision optical components. With 50 years of accumulated expertise in optical design and lens fabrication, NCIR is one of the few R&D institutions in Taiwan capable of manufacturing space-grade aspheric mirrors for satellites, supporting national space programs and the development of the space industry. Since the FORMOSAT-2 mission, NCIR has been dedicated to the satellite industry. NCIR has participated not only in the development of primary and secondary mirrors for FORMOSAT-5 and FORMOSAT-8, but also the design and development of the Telescope of Lilium II, a low-Earth-orbit CubeSat. Through continued advancement of high-resolution optical systems, NCIR enables Taiwan's satellites to see more clearly and reach farther.

At the same time, NCIR provides opto-electro-mechanical integration and vacuum technical services, collaborating with industry, academia, research institutions, and the medical sectors. NCIR has been honored with ten awards, including the National Innovation Award, Future Tech Award, Innovation Award for Metrology Technology Research and Development, International Innovation and Invention Competition (IIIC), Park Systems Nano Image Challenge 2025, and

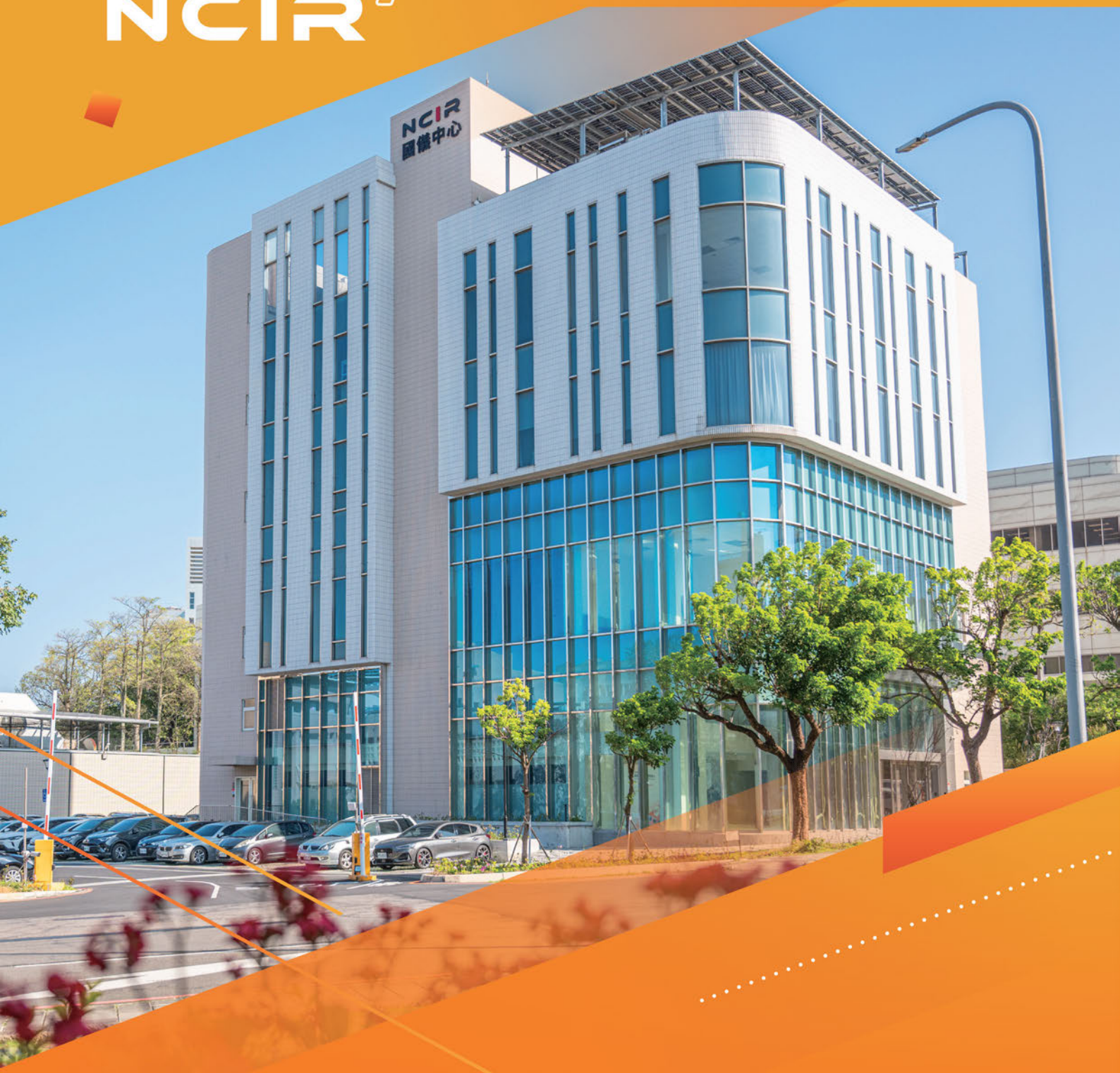
NIAR Outstanding Science and Technology Contribution Award. Moreover, to help the industry overcome bottlenecks in conventional silicon carbide (SiC) grinding technology, NCIR and DEUVtek Co., Ltd. have jointly developed an infrared nanosecond laser-based dry grinding process for SiC wafers. This innovation reduces wafer breakage rates to 1% and increases processing speed by approximately 30%, thereby enhancing both the efficiency and quality of SiC wafer grinding to meet industrial demands for high-performance power devices.

NCIR actively expands its international collaboration. In addition to participation in international seminars, exhibitions, and visits to global organizations, NCIR has invited renowned international scholars and outstanding experts to deliver lectures or conduct training programs. Key partners from academia, research institutions, and industry engage in substantive collaboration through commissioned projects and joint research initiatives, thereby deepening NCIR's international partnerships. NCIR has long been committed to fostering engagement with the IEEE Instrumentation and Measurement Society (IEEE IMS), a leading global society in instrumentation science and technology, and currently serves as the host of its Taipei Chapter. Following the recommendation of the IEEE IMS Taipei Chapter, the first-prize-winning team from the college & above group of the 16th NAIR *i*-ONE Instrument Technology Innovation Competition (National Tsing Hua University) traveled to Germany to compete in the 2025 IEEE International IMS Student Contest and won second place. These achievements highlight the research capabilities of Taiwanese students in innovative instrument technology and demonstrate NCIR's influence in creating more opportunities for Taiwan's outstanding young talents on the international stage.

Against the backdrop of global technological competition and AI-driven transformation, NCIR continues to leverage its core technologies as a foundation and innovation as a driving force to build a research service platform with international impact. By bridging academic R&D creativity with industrial needs, NCIR will collaborate with academia, industry, and government to enhance Taiwan's technological independence in scientific instruments, promote industrial advancement, improve quality of life, and fulfill its mission of "**Innovating Technology, Safeguarding Taiwan**."

主任 Director General

潘正堂 Chen-Tang Pan



Overview of NCIR

基本概況

組織架構
Organization Chart

主任室
Director General's Office

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
- 先進材料製程與設備組
  Advanced Process and Equipment Development Division
- 智慧鍍膜設備發展組
  Intelligent Coating Equipment Technology Division

光學技術與應用群
Optical Technology Group

- 智慧機電傳動組
  Intelligent Automation Systems Division
- 光機電系統整合組
  Opto-Mechatronic Systems Integration Division
- 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 Development Division

財會小組
Finance & Accounting Team

企劃小組
Strategy & Planning Team

人力資源小組
Human Resources Team

國際合作小組
Office of International Collaboration

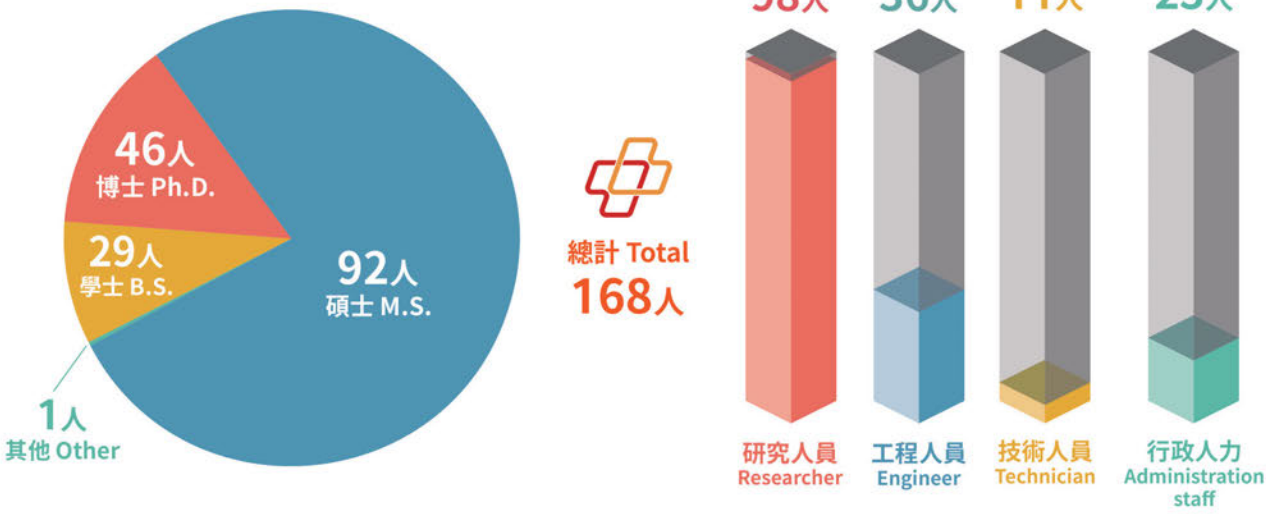
職業安全衛生委員會
Occupational Safety and Health Committee

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

人力配置
Deployment of Manpower



建構研發服務平台
R&D Service Platforms

國儀中心配合國科會政策並積極落實國研院賦予的任務，建構技術服務平台，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「**智慧傳動與生醫光電技術服務平台**」，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 Institutes of Applied Research (NIAR), NCIR has established 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 "**Intelligent Transmission and Biophotonics Technologies**". Leveraging these platforms, NCIR is committed to advancing frontier technologies while providing key components and core instrumentation in collaboration with leading domestic and international universities, semiconductor research institutes, and national defense research centers. It has always been NCIR'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

- 真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）智慧傳動與生醫光電技術服務平台

Promotion Platform for Intelligent Transmission and Biophotonics Technology Service

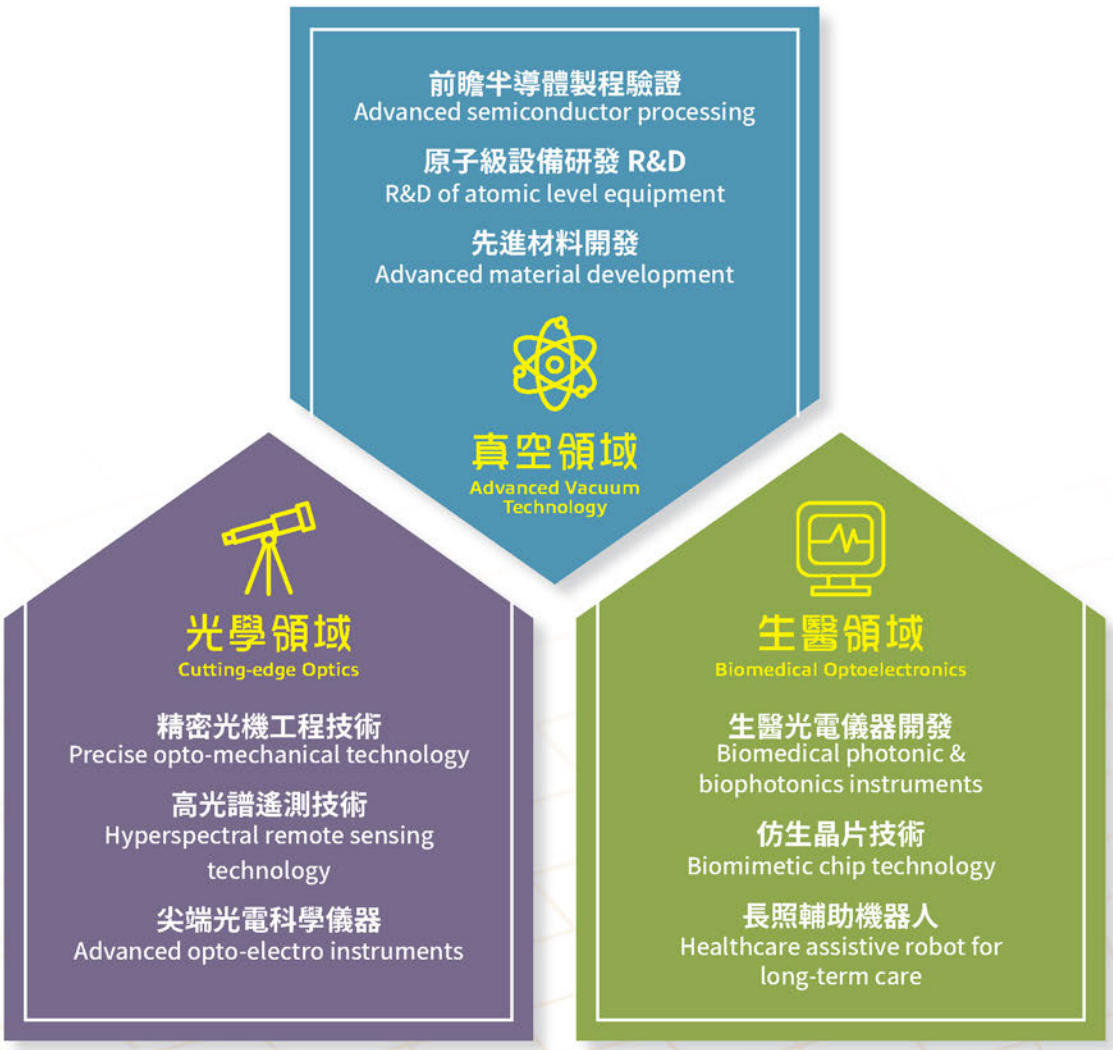
服務項目 Service Items

- 生醫光電儀器客製開發
  Customized development of biophotonics instruments
- 生醫晶片共通關鍵模組客製開發
  Customized development of common key modules for biomedical chips
- 仿生微工廠培養鏈與系統開發
  Development of Biomimetic Factory Culture Chains and Systems
- 智慧醫護輔具客製開發
  Customized development of smart medical aids
- 醫療器材工程認證輔導
  Consulting for medical device engineering certification

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

國儀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。

NCIR is the only organization in Taiwan that can serve all academic fields and develop customized scientific instruments essential for cutting-edge research. It has 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.



主要服務面向
Main Services

政府部門 Government

執行重大政策任務
Executing crucial policy tasks

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

支援重要學術計畫
Supporting major academic projects

參與國科會產學合作計畫、專案計畫
Participating in NSTC industry-academia collaboration projects and special programs

支援學研計畫原型製作
Supporting the prototyping of research programs

建立聯合實驗室共享研究資源
Establishing joint laboratories to facilitate the sharing of research resources

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

新技術（產業）商品化
Commercializing novel technologies

客製化光電及真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

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

推動科普教育
Boosting popular science education

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 "NCIR eNEWS" for news, activities and instrument knowledge

參與國內外光電、真空技術與儀器工程相關學術研討會相關學術研討會
Participating in domestic and international seminars on photonics, vacuum and instrument engineering technologies

Notable Achievements & Milestones in 2025

亮點成果與大事紀要

2025/01/10

國儀中心與中山大學首度攜手合辦「2025 半導體未來科技論壇」

NCIR and National Sun Yat-sen University Jointly Host "2025 Future Semiconductor Technology Forum"

學院黃義佑特聘教授 (前排右 6)、國儀中心潘正堂主任 (前排右 5) 及與會者合影，期望藉由論壇強化雙方學研合作成效。
Distinguished Prof. I-Yu Huang (NSYSU College of Semiconductor and Advanced Technology Research; 6th from right, front row) and NCIR Director General Cheng-Tang Pan (5th from right, front row) are pictured with other participants. The event strengthened academic and research collaboration.

國儀中心與國立中山大學舉辦「2025半導體未來科技論壇」，聚焦五大新興科技領域爲主軸，邀請中山大學相關專長領域教授與國儀中心同仁進行分享與討論。藉由本次交流活動持續強化南臺灣的產學交流，期待未來能進一步整合彼此的研究資源與量能，加值南臺灣的半導體材料與設備產業供應鏈。

NCIR and the National Sun Yat-sen University (NSYSU) co-hosted the "2025 Future Semiconductor Technology Forum". The forum focused on five emerging technology fields. Professors from NSYSU with related areas of expertise and colleagues from NCIR were invited to share and discuss. Through this exchange event, the industry–academia communication in southern Taiwan is continuously strengthened. It is anticipated that by integrating the research resources and capabilities of both parties, the value of the semiconductor materials and equipment supply chain in southern Taiwan can be significantly enhanced.

2025/01/28

國儀中心參與全球最大國際光電展 SPIE Photonics West 2025

NCIR Participates in SPIE Photonics West 2025, the World's Largest International Photonics Exhibition

國儀中心持續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 2025，此會議於美國舊金山舉辦，多位國內外學界教授及業界高階主管至中心攤位參觀，分享產

業經驗與建議，並針對多項合作議題深入交流。透過國際研討會及光電領域專業展覽推廣，擴散國儀中心研發成果與技術能量，提升國際能見度。

NCIR continuously participates in SPIE Photonics West 2025, the world's largest international conference and exhibition in photonics. Held in San Francisco, the event attracts numerous academic professors and senior industry executives who visit NCIR's booth, share industry insights and recommendations, and engage in in-depth discussions on potential collaborations. By participating in international workshops and specialized photonics exhibitions, NCIR promotes research outcomes and technological capabilities, enhancing global visibility.

國儀中心持續參加 SPIE Photonics West 2025 國際光電盛會，左圖爲國儀中心潘正堂主任 (圖中) 帶領同仁參展合照；右圖爲同仁與來自國內外的與會者交流。

NCIR participated in the SPIE Photonics West 2025. The image on the left shows NCIR Director General Dr. Cheng-Tang Pan (center) leading team members at the exhibition booth, while the right image shows team members engaging in discussions with participants from around the world.

2025/02/20

「國科會智慧微塵感測器技術專案學研產媒合交流會」搭建產學研合作橋梁

"NSTC Smart Dust Sensor Technology Academia–Industry Collaboration Forum" Builds a Bridge for Academia - Research - Industry Collaboration

智慧微塵感測器技術學研產媒合交流會與會人員合照。

Group photo of participants at the Smart Dust Sensor Technology Academic-Industrial Collaboration Forum.

國儀中心執行國科會「智慧微塵感測器技術研發服務平台專案」，透過建立自主感測器技術能量，協助學研開發創新感測器，已產出多項學研技術成果。藉由產學研媒合交流會，串接產業需求與落地應用，吸引 6 組學研團隊與 8 家廠商共同參與，期望未來攜手打造感測器國產化生態系統。

NCIR is executing the National Science and Technology Council (NSTC) "Development of the Smart Dust Gas Sensor R&D Services." By establishing in-house sensor technology capabilities, it has also assisted academia and research institutions in developing innovative sensors, resulting in multiple research outcomes. Through this forum, a strong link was established between industry needs and practical applications, drawing participation from 6 academic research teams and 8 companies. The event fosters future collaboration toward developing a localized sensor technology ecosystem.

2025/03/15

挑戰未來產線全能 MVP 「國研盃智慧機械競賽」清華大學奪冠

Challenging the Future Production Line's All-Round MVP, National Tsing Hua University Claims Victory in "NIAR Smart Machinery Competition"

國儀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 (Student Design Competition, SDC)，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。 114 年設計競賽題目爲「機器人挑戰未來產線全能 MVP」(Assembly Line Sorting and Packaging)，本年度由國立清華大學 (清大)「DIT-bounty Robot」團隊勇奪設計競賽第一名、演講競賽則由清大江鎮宇同學奪冠。

In collaboration with the Taiwan Section of the American Society of Mechanical Engineers (ASME), NCIR co-hosted the Student Design Competition (SDC) of "NIAR Smart Machinery Competition." It comprised a Student Design Competition and an Oral Presentation Competition. Design competition features diverse, real-life-inspired themes each year, aiming to guide students in integrating theoretical knowledge with practical engineering skills. This helps attract more young talent to pursue careers in instrumentation design and manufacturing. The 2025 design competition task was titled "Robots Challenge the Future Production Line's All-round MVP" (Assembly Line Sorting and Packaging). The "DIT-bounty Robot" team from the National Tsing Hua University (NTHU) won the first place in the Student Design Competition this year; Zhen-Yu Jiang from NTHU received top honors in the Oral Presentation Competition.

2025「國研盃智慧機械競賽」比賽現場與頒獎典禮大合照。
The competition site and the awards ceremony of "2025 NIAR Smart Machinery Competition."

2025/03/25

台灣儀器科技研究中心正式更名為「國家儀器科技研究中心」

Taiwan Instrument Research Institute (TIRI) Officially Renamed to "National Center for Instrumentation Research (NCIR)"

隨著國研院扮演國家科技推動的角色日趨重要，與全球頂尖研究機構的合作也日益頻繁，為了呈現國研院的專業形象，提升大眾對國研院的認知，因此國研院更新英文名稱為「National Institutes of Applied Research」並同步調整企業識別；此外，國研院轄下之台灣儀器科技研究中心，為突顯其為以研究導向的國家級單位，能更有效率推動國家任務與政策，亦同步更名為「**國家儀器科技研究中心**」，簡稱國儀中心，英文名稱為 National Center for Instrumentation Research，英文簡稱 NCIR。

As the organization takes on an increasingly important role in advancing national science and technology and expands its collaboration with leading global research institutions, NIAR has updated its English name to the "National Institutes of Applied Research" and refreshed its corporate identity to better reflect its professional image and enhance public recognition. In line with this development, the Taiwan Instrument Research Institute (TIRI), a subordinate institute of NIAR, has been renamed the **National Center for Instrumentation Research (NCIR)**, highlighting its mission as a national-level research institution and strengthening its ability to carry out national missions and policies.

國研院英文名稱更名揭牌記者會現場，儀科中心正式更名為國儀中心。
Press conference for the unveiling of NIAR's new English name, marking the official renaming of TIRI to NCIR.

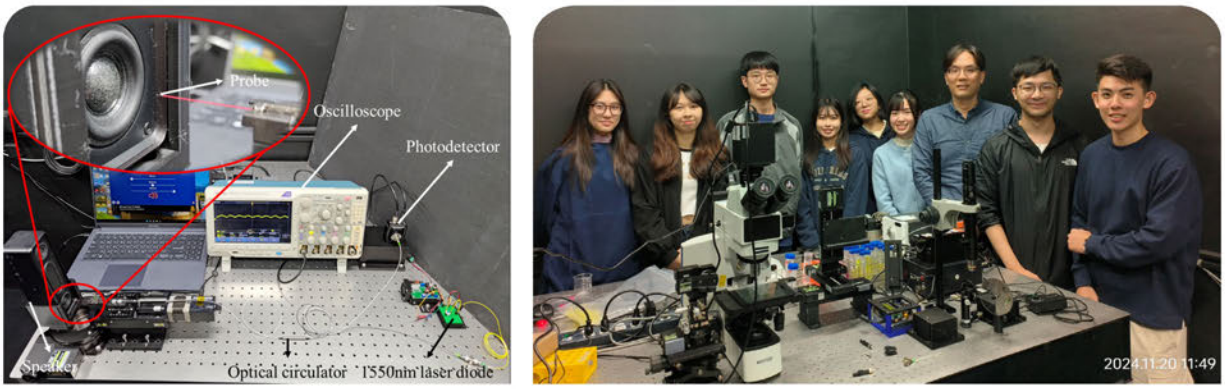
2025/04/01

學、研、醫協力合作開發新型微米級光纖麥克風，造福各界聽障人士

Academia, Research, and Medical Collaboration in Developing Novel Micron-Scale Fiber-Optic Microphone to Benefit Individuals with Hearing Impairments

國儀中心落實國科會產學研技術整合的宗旨，偕同國立陽明交通大學（陽明交大）、振興醫院學研團隊成功開發出「微型法布里－珀羅光纖光學麥克風」，解決麥克風受磁場干擾之問題，為聽障者提供更無礙的聲音感受，其研究成果榮登光學領域頂級期刊《*Optics & Laser Technology*》。由振興醫院團隊發想光纖麥克風的構造概念，接著由國儀中心協助麥克風的膜片製程與檢測，並由陽明交大團隊將光纖與薄膜結合，此新型微米級光纖麥克風輕薄尺寸如同一根頭髮，而靈敏度比現有技術提升約 37 %，能更細微地捕捉聲音變化，同時能偵測更高頻的聲音，未來可應用於穿戴式裝置上。

NCIR has fulfilled the mission of NSTC's industry–academia–research technology integration by collaborating with academic and medical research teams from National Yang Ming Chiao Tung University (NYCU) and Cheng Hsin General Hospital to develop a "Miniaturized Fabry-Perot fiber-optic microphone based on capillary tube and hydrogel diaphragm." This innovation has solved the problem of microphone interference from magnetic fields, providing a less obstructed sound experience for deaf and hard-of-hearing people. Research results were published in < *Optics & Laser Technology* >, a top-tier journal in optics. The fiber-optic microphone's conceptual design was initiated by the team at Cheng Hsin General Hospital. NCIR assisted with the diaphragm fabrication and testing; the NYCU team integrated the optical fiber with the micro-diaphragm. The new micron-scale fiber-optic microphone is as thin and lightweight as a human hair, featuring a sensitivity approximately 37% higher than that of existing technologies. It can detect subtle variations in sound and capture higher-frequency acoustic signals. This makes its integration into future wearable devices possible.



左圖爲研究所使用的聲壓測試系統；右圖爲國立陽明交通大學團隊與研究成果合影。
Left image: Sound pressure testing system used in this study; Right image: The NYCU team with its research achievement.

2025/05/19

參與 IEEE I²MTC 2025 強化臺灣於國際儀器科技社群之影響力

Participating in IEEE I²MTC 2025 to Strengthen Taiwan's Influence in the Global Instrumentation Technology Community

國儀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) 於德國肯尼茲盛大舉辦，國儀中心聯合國內學界，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。

NCIR has long engaged with the international professional organization, the IEEE Instrumentation and Measurement Society (IEEE IMS), and hosts the IEEE IMS Taipei Chapter. The Society's flagship annual conference, IEEE International Instrumentation and Measurement Technology Conference, is held in Chemnitz, Germany. NCIR collaborates with academic institutions in Taiwan to showcase its core research and technological capabilities

through presentations and exhibition activities. NCIR Director General Dr. Cheng-Tang Pan, as Chapter Chair, attended the Annual Chapter Chair Meeting, where he reported on the Taipei Chapter's activities and exchanged ideas with the Society's leadership to enhance international engagement.

國儀中心聯合國內教授共同參與 IEEE I²MTC 2025，左圖爲 I²MTC 2025 大會主席 Olfa Kanoun 教授蒞臨中心攤位；右圖爲同仁向與會者介紹國儀中心技術服務能量。
NCIR collaborated with Taiwanese professors to participate in IEEE I²MTC 2025. Left: Professor Olfa Kanoun, Chair of I²MTC 2025, visiting the NCIR booth; Right: NCIR staff introducing NCIR's technical service capabilities to conference attendees.

2025/06/04

國儀中心力助清大研究團隊 打造綠色智慧製造產線

NCIR Supports NTHU Team in Establishing a Green Smart Manufacturing Line

國儀中心與清大動力機械工程學系李明蒼教授團隊合作「高精度三維自由曲面光電半導體元件虛實複合加工技術及系統開發專案計畫」，所開發的雷射鍍膜及圖樣化技術可在常壓常溫下進行，並將原本多道工序縮減爲一次工序即可完成圖樣化，大幅降低製程所造成的材料成本及能源消耗。國儀中心協助整合光電半導體元件研拋與雷射輔助大氣電漿鍍膜技術，藉由學研合作打造智慧製造產線，並成功導入業界實際應用。

NCIR has collaborated with the research team led by Professor Ming-Tsang Lee from the NTHU Department of Power Mechanical Engineering (PME) on the project "Development Project for a Hybrid Physical-Virtual Machining Technology and System for High-Precision 3D Freeform Photonic Semiconductor Components." This novel laser deposition and patterning technology, operating under ambient temperature and pressure, significantly shortens processing time and complexity. It remarkably reduces material costs and energy consumption, while offering high flexibility in both process design and system integration. NCIR has contributed to the integration of grinding and polishing techniques for photonic semiconductor components with laser-assisted atmospheric plasma coating technology, enabling the development of a smart manufacturing line through academia–research collaboration and its successful deployment in industry.

清大動機系與國儀中心研究團隊針對光電半導體產品開發出「雷射低碳製造技術」。
The NTHU PME and NCIR research team developed a laser based green manufacturing technology tailored for optoelectronic and semiconductor products.

2025/06/24

攜手鼎極科技開發雷射研磨技術 提升碳化矽晶圓製程產能

NCIR Collaborates with DEUVtek to Develop a Laser Grinding Technology for the Mass Production of SiC Wafers

由國儀中心開發關鍵的「雷射研磨技術」，再由鼎極科技股份有限公司（鼎極科技）將此技術落地轉譯，共同開發「紅外線奈秒雷射應用於碳化矽 (SiC) 晶圓乾式研磨製程」關鍵技術，提升碳化矽晶圓研磨速率與品質，顯著降低製程成本與材料損耗。雙方將持續推動此項技術商品化，並進一步擴展至 8 吋碳化矽晶圓與多層異質結構元件應用，或其他高硬度材料之精密加工，如氮化鎵、陶瓷基板與先進封裝材料，爲我國自主發展功率半導體製程提供實質支援。

NCIR developed the key "laser grinding technology," and DEUVtek Co., Ltd. (DEUVtek) translated it into an industrial application. These two parties co-developed the critical technology of "infrared nanosecond laser processing for silicon carbide (SiC) wafer grinding," which has enhanced the grinding rate and quality of SiC wafers while significantly reducing process costs and material loss. Both sides will continue to commercialize this technology , with plans to extend its application to 8-inch SiC wafers and heterojunction devices. The technology also holds great potential for the precision processing of other hard materials, such as gallium nitride (GaN), ceramic substrates, and advanced packaging materials. It provides concrete support for Taiwan's independent development of power semiconductor fabrication processes.

左圖爲「開發雷射研磨技術提升碳化矽晶圓製程產能」記者會；右圖爲整合國儀中心打造之 SiC 雷射研磨關鍵模組之設備。
Left: Press conference on "Developing Laser Grinding Technology to Enhance SiC Wafer Processing Capacity."
Right: Equipment integrating the key SiC laser grinding module developed by NCIR.

2025/08/21

國科會 AI 機器人 × 智慧製造創新技術媒合交流會 搭建產學交流平台

NSTC AI Robotics × Smart Manufacturing Innovation Technology Matchmaking Forum Builds an Industry-Academia Exchange Platform

由國科會指導、國儀中心承辦「AI 機器人 × 智慧製造創新技術媒合交流會」，在 2025 台北國際自動化工業大展期間，以「技術發表 × 實體展示」雙軌呈現方式，精彩展現近年來具代表性的前瞻研發成果。展示項目從人機協作機器人、智慧微塵感測器、虛實加工整合技術，到次世代智慧製造方案，展現智慧製造核心研發能量。同時，舉辦「Meet @ 智慧機械」活動，以「一對一媒合對談」方式進行，讓產業先進與學校團隊能有進一步的交流互動，搭起創新技術與產業落地的橋梁。

Guided by NSTC and organized by NCIR, the "AI Robotics × Smart Manufacturing Innovation Technology Matchmaking Forum" was held during the 2025 Automation Taipei. Adopting a dual-track approach that integrates technology presentations with physical demonstrations, the forum highlighted key forward-looking R&D achievements. These included human–robot collaboration, smart dust sensing technologies, hybrid physical–virtual machining integration, and next-generation smart manufacturing solutions, underscoring Taiwan's core R&D strengths in smart manufacturing. At the same time, the "Meet @ Smart Machinery" event was held. It features "one-on-one matchmaking sessions" to facilitate exchanges and interactions between industry leaders and academic research teams. It also serves as a bridge between innovative technologies and industrial implementation.

本次媒合交流會透過「技術發表 × 實體展示」雙軌呈現學研創新成果，並安排多場媒合對談讓產學界夥伴深入交流。
The Matchmaking Forum showcased academic and research innovations through a dual-track approach of technology presentations and physical demonstrations, alongside multiple matchmaking sessions that facilitated in-depth exchanges between industry and academia.

2025/08/22

「2025先進光學技術與半導體設備技術產學研交流研討會」共探產學研新契機

2025 Workshop on Advanced Optical and Semiconductor Equipment Technologies to Foster New Opportunities for Industry–Academia–Research Collaboration

「2025 先進光學技術與半導體設備技術產學研交流研討會」產學研夥伴合影。
Group photo of participants at the "2025 Workshop on Advanced Optical and Semiconductor Equipment Technologies."

國儀中心為促進先進光學技術與半導體設備領域的產學研合作與技術交流，舉辦「2025先進光學技術與半導體設備技術產學研交流研討會」暨「國家儀器科技研究中心技術服務推廣說明會」，本次研討會邀請產學界代表進行專題分享，國儀中心則針對光學與真空的研發能量與客製化技術服務進行技術服務推廣說明，匯聚業界、學界與研究機構的專家，透過此次交流會議，共同探討尖端技術發展與合作契機，共同實現產業升級與設備加值，打造臺灣高科技產業的嶄新藍圖。

To foster collaboration and technical exchange in advanced optical technologies and semiconductor equipment, NCIR hosted the "2025 Workshop on Advanced Optical and Semiconductor Equipment Technologies" and the "NCIR Technology Service Promotion Seminar." The workshop invited industry and academic representatives to deliver keynote presentations. NCIR showcased its R&D capabilities and customized technical services in optics and vacuum technologies. Bringing together experts from industry, academia, and research institutions, the networking event facilitated discussions on cutting-edge technological advancements and new collaboration opportunities, thereby driving industrial upgrading, enhancing equipment value, and shaping a new blueprint for Taiwan's high-tech industries.

邀請台達電子工業股份有限公司彭志誠處長分享智慧製造整合解決方案。
Division Manager Chih-Cheng Peng of Delta Electronics, Inc., was invited to present on integrated smart manufacturing solutions.

2025/09/10

參與 2025 臺灣國際半導體展 推廣前瞻半導體技術研發成果

NCIR Highlights Cutting-Edge Semiconductor Technology R&D Achievements at SEMICON Taiwan 2025

國儀中心配合國家政策支援科技發展，以驅動儀器設備在地化爲使命，並因應半導體元件製程與先進晶片封裝技術之應用發展，已提供學界與業界多套自研自製眞空鍍膜系統；近年更與國內半導體設備大廠合作，協助產業研發下世代製程關鍵設備。國儀中心於「臺灣國際半導體展」(SEMICON Taiwan 2025) 中展現半導體先進製程臨場檢測技術以及客製特規光學元件之服務成果，並安排國儀中心半導體薄膜製程及光學檢測系統的專家到場與產業先進對談，了解產業需求及技術瓶頸。透過本次展覽及技術對談交流，吸引更多業界人士投入儀器設備產業，扭轉現今多爲代工的半導體產業分布，厚植及深耕本土基礎儀器技術，以迎接半導體設備自主化時代之來臨。

Aligned with national policies supporting technological development, NCIR is committed to instrumentation localization. In response to advances in semiconductor component manufacturing processes and advanced chip packaging applications, it provides multiple self-developed vacuum coating systems to academia and industry. In recent years, it has collaborated with leading Taiwanese semiconductor equipment manufacturers to advance the development of next-generation critical process equipment. At SEMICON Taiwan 2025, NCIR showcased advanced *in-situ* inspection technologies for semiconductor processes and customized optical component services, while NCIR experts engaged with industry to explore industrial needs and technical challenges. NCIR attracts more industry professionals to the instrumentation sector through this exhibition and technical exchange. It also aims to rebalance the semiconductor industry structure, which is currently dominated by contract manufacturing, and to strengthen and cultivate local foundational instrumentation technologies, thereby advancing toward semiconductor equipment self-sufficiency.

國儀中心於 SEMICON Taiwan 2025 展現協助半導體設備國產化的服務成果。
NCIR showcased its achievements in supporting the localization of semiconductor equipment at SEMICON Taiwan 2025.

2025/09/18

支援雲科大團隊開發複合動力垂直起降無人機專屬之多光譜遙測系統

Supporting YunTech Teams in Developing a Multispectral Remote Sensing System for Hybrid-Power VTOL Drones

國儀中心深耕自主前瞻遙測光學系統整合與精密光學關鍵技術，並與國立雲林科技大學（雲科大）共同開發「高空無人機之光學遙測酬載」，成功完成四波段多光譜（可見光與近紅外光）高解析光學遙測取像系統。該系統搭載於雲科大自製複合動力垂直起降無人機，突破傳統小型無人機在飛航時間與任務規模上的限制，樹立國內自主無人機光學酬載與智慧遙測技術的重要里程碑，有助提升高空無人機於國土環境監測之自主性，並降低對國外高價光學酬載的依賴。

國儀中心與雲科大共同研發之多光譜遙測系統，搭載於雲科大自製複合動力垂直起降無人機。
The multispectral remote sensing system co-developed by NCIR and YunTech is mounted on YunTech's in-house hybrid-power VTOL drone.

NCIR is dedicated to integrating autonomous, cutting-edge remote sensing optical systems and developing precision optical key technologies. In collaboration with National Yunlin University of Science and Technology (YunTech), NCIR has co-developed an "optical remote sensing payload for high-altitude drones" and completed a high-resolution four-band multispectral (visible and near-infrared) imaging system. This system was mounted on YunTech's in-house hybrid-power Vertical Take-Off and Landing (VTOL) drone, overcoming the limitations of traditional small drones in flight duration and mission scale. This achievement marks a significant milestone in Taiwan's domestic development of drone-based optical payloads and intelligent remote sensing technology. It strengthens autonomy in high-altitude environmental monitoring while reducing reliance on expensive foreign optical payload systems.

2025/10/18

「國研盃 *i*-ONE 儀器科技創新獎」培育儀器科技創新人才 力助學子站上國際舞台

"NIAR *i*-ONE Instrument Technology Innovation Competition" Fosters Instrumentation Talent for the International Stage

第 17 屆「國研盃 *i*-ONE 儀器科技創新獎」用創新定義未來儀器。
The 17th "NIAR *i*-ONE Instrument Technology Innovation Competition" redefining the future of instruments through innovation.

為推動尖端科技發展與儀器自製人才培育，國儀中心自 2009 年創辦「國研盃 *i*-ONE 儀器科技創新獎」至今邁入第 17 屆，今年專上組由長庚大學團隊的作品「微流體快速即時聚合酶連鎖反應儀」奪得首獎，中學組由嘉義高工團隊所完成之「開發家用輕巧鈑金模具及飾片造型機」拔得頭籌。此外，本屆 *i*-ONE 競賽特別增設「AI 應用特別獎」，鼓勵團隊將人工智慧運用至領域，最終由中學組中興大學附屬高中團隊的「籃球運球動作分析與教練系統」脫穎而出。值得一提的是，在協辦單位 IEEE IMS 臺北支會推薦下，第 16 屆 *i*-ONE 專上組首獎的清華大學團隊赴德國參加 2025 IEEE IMS 國際學生競賽，榮獲第二名佳績，展現出臺灣學子於創新儀器的科研實力，並為我國優秀青年學子爭取更多國際舞台。

第 16 屆國研盃 *i*-ONE 儀器科技創新獎冠軍清華大學團隊榮獲 2025 IEEE IMS 國際學生競賽第二名。
The NTHU team, champion of the 16th NIAR *i*-ONE Instrument Technology Innovation Competition, won 2nd place in the 2025 IEEE IMS International Student Competition.

To promote the development of cutting-edge technologies and cultivate talent in instrument development, NCIR has hosted the "NIAR *i*-ONE Instrument Technology Innovation Competition" since 2009, now in its 17th session. This year, the first prize in the College and Above Group was awarded to a team from Chang Gung University for their work, "Microfluidic Rapid Real-time Polymerase Chain Reaction Device." First prize in the High School Group went to a team from National Chia-Yi Industrial Vocational High School for their project, "Development of a Compact Home-use Sheet Metal Molding and Decoration Machine." This year's *i*-ONE competition introduced a new "AI Application Special Award" to encourage teams to integrate artificial intelligence into their projects. The award was won by a senior high school team from The Affiliated Senior High School of National Chung Hsing University for their "Basketball Dribbling Motion Analysis and Coaching System." With a recommendation from the co-organizer, the IEEE IMS Taipei Chapter, the first-prize winner in the College and Above Group of the 16th *i*-ONE competition, the NTHU team, participated in the 2025 IEEE IMS International Student Competition in Germany and won second place. The outstanding performance demonstrates the strong research and innovation capabilities of Taiwanese students in instrumentation technology and secures more international exposure for Taiwan's talented youth.

2025/11/04

國研院 × 國資圖 科普特展
《空氣裡的秘密偵探：智慧微塵感測器》

NIAR × NLPI Science Exhibition:
"Secret Detectives in the Air: Smart Dust Sensors"

國儀中心與國立公共資訊圖書館（國資圖）合作，辦理為期半年的「空氣裡的秘密偵探：智慧微塵感測器」科普特展。國儀中心建立「智慧微塵感測器技術研發服務平台」，鏈結國內學術界，致力於開發體積小、靈敏度高、耗能低且能大量生產的微型氣體感測系統，這些創新技術不僅守護民眾呼吸健康，也加速感測器落地應用，強化臺灣在智慧科技領域的能量。本次科普特展將引導民眾探索空氣中「看不見的秘密」，認識默默守護你我健康的智慧微塵感測器。

NCIR partnered with the National Library of Public Information (NLPI) to host a six-month public science exhibition titled "Secret Detectives in the Air: Smart Dust Sensors." NCIR also established "Development of the Smart Dust Gas Sensor R&D Services," partnering with Taiwan's academic community to develop miniaturized gas-sensing systems that are small, highly sensitive, low-power, and suitable for mass production. These innovations protect public respiratory health while accelerating the practical application of sensors and strengthening Taiwan's capabilities in intelligent technologies. This science exhibition invites the public to explore the "invisible secrets" in the air and discover smart dust sensors that quietly safeguard our health.

藉由展品展示及多媒體解說，國儀中心帶領民眾探索空氣中「看不見的秘密」。
Through exhibits and multimedia presentations, NCIR leads the public in exploring the "invisible secrets" in the air.

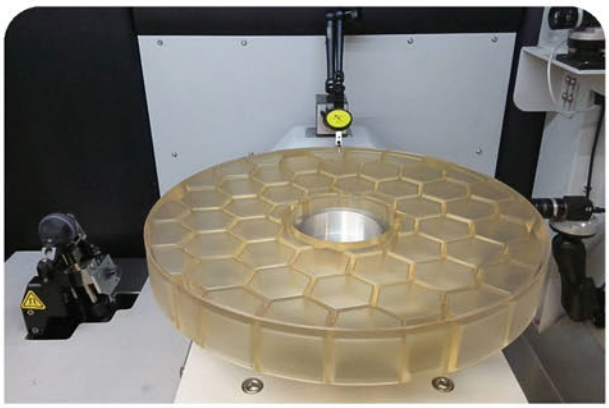
2025/11/29

深耕遙測光學自主關鍵技術 國儀中心支援福衛八號任務成功升空

NCIR Advances Self-Developed Remote Sensing Optical Technologies, Supporting Successful Launch of Formosat-8

國儀中心深耕自主前瞻遙測光學系統整合與精密光學元件關鍵技術及服務能量，已累積 50 年光學設計與鏡片製作經驗，為國內少數能製作大口徑非球面鏡太空衛星鏡片之研發單位，近年來已協助國家太空中心完成研製 13 套福衛八號太空主鏡與次鏡鏡片，研製之鏡片均符合太空中心設計規格，支持國家太空計畫任務與太空產業發展。首枚福八衛星「齊柏林衛星」搭載本中心研製之遙測酬載主次鏡，已於 114 年 11 月 29 日順利搭乘 Space X 火箭成功升空，展現我國在太空光學關鍵技術上的自主研發成果。

NCIR has a long-standing commitment to the integration of advanced self-developed remote sensing optical systems, while advancing key precision optics technologies and service capacities. With 50 years of accumulated expertise in optical design and fabrication, NCIR is one of the few research institutions in Taiwan with end-to-end capabilities in manufacturing space-grade aspheric mirrors. NCIR has supported the Taiwan Space Agency (TASA) in recent years by fabricating 13 sets of primary and secondary mirrors for the Formosat-8 satellite mission. Each lens manufactured meet TASA's stringent design specifications, thereby supporting national space programs and fueling the growth of Taiwan's space industry. The first satellite of the Formosat-8 (FS-8A), equipped with primary and secondary mirrors indigenously developed by NCIR, was successfully launched on November 29, 2025, aboard a SpaceX rocket. It demonstrates Taiwan's achievements in the indigenous development of critical space optical technologies.



國儀中心累積 50 年光學設計與鏡片製作經驗，爲國內少數能製作大口徑非球面鏡太空衛星鏡片之研發單位。
Leveraging five decades of experience in optical design and lens fabrication, NCIR is one of the few institutions in Taiwan capable of producing space-grade aspheric mirrors for satellites.

2025/12/16

國儀力助學研跨國合作 寫下再生醫學關鍵篇章

NCIR Facilitates International Academic Collaborations, Advancing a New Era in Regenerative Medicine

國儀中心與陽明交大鄭子豪副校長團隊合作開發可自動培養與分化幹細胞的儀器（先鋒一號，Cyto Chamber），從溫控、二氧化碳濃度調控、培養液供給與排除，到細胞顯微攝影一氣呵成。這些原本仰賴大量人力的繁瑣步驟，如今透過自動化得以高效率完成，象徵再生醫學邁向產業化的重要里程碑。這項技術成果在日本 CiRA 基金會首次亮相，立刻引起日本產業界與研究機構高度關注，是臺日跨國科研合作的成功典範，也是工程醫學與晶片科技結合的重要範例。

NCIR collaborates with the research team led by NYCU Vice President Tzu-Hao Cheng to develop an Automated Stem Cell Cultivation System (Pioneer 1, Cyto Chamber). This system integrates temperature control, CO_2 concentration regulation, media exchange, and cellular microscopic imaging into a single, seamless automated workflow. The previously complex and labor-intensive processes can now be completed efficiently through automation, marking a significant milestone in the industrialization of regenerative medicine. This technological achievement debuted at the CiRA Foundation in Japan, immediately attracting strong attention from the Japanese industry and research institutions. This initiative represents a successful model of Taiwan–Japan scientific collaboration and a premier example of interdisciplinary integration across engineering, medicine, and semiconductor technology.

國儀中心與陽明交大合作開發「自動化幹細胞培養與分化系統」。
NCIR and NYCU jointly developed the "Automated Stem Cell Cultivation System."

114年獲獎記錄
Awards in 2025

國儀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，協助學研團隊獲得**國家新創獎**與**未來科技獎**等多項肯定，114 年度獲獎紀錄整理如下表：

Leveraging its long-standing expertise in opto-mechatronics integration and vacuum technology, NCIR has established a cross-disciplinary custom instrument R&D platform to support academic research. This platform has empowered research teams to achieve numerous accolades, including the **National Innovation Award** and the **Future Tech Award**. Below is a summary of the awards received in 2025.

競賽活動 Activities	得獎隊伍 Teams	獲獎項目 Prizes
2025 未來科技獎 The Tech Innovation Excellence Award (TIE Award)	國儀中心、臺北醫學大學與國立臺北大學團隊合作開發「前瞻性穿顱干擾波：開啟非侵入式深腦刺激的新篇章」 "Prospective Transcranial Temporal Interference Stimulation: Pioneering a New Era of Non-Invasive Deep Brain Stimulation" jointly developed by Taipei Medical University, National Taipei University and NCIR.	2025 未來科技獎 2025 TIE Award
第 22 屆國家新創獎 The 22th Annual National Innovation Awards	國儀中心與林口長庚醫院合作研發「創新式心房耳無導線節律器固定器」 "Innovative Fixation System for a Leadless Pacemakers in the Atrial Appendage" jointly developed by Linkou Chang Gung Memorial Hospital (CGMH) and NCIR.	學研新創獎 Academic Innovative Award
	國儀中心與國立陽明交通大學、振興醫院合作開發「超微型電磁強健光纖光學麥克風」 "Miniaturized Electromagnetic Robust Fiber-Optic Microphone" jointly developed by NYCU and NCIR.	學研新創獎 Academic Innovative Award
	國儀中心與嘉義長庚醫院合作開發「開發新型介質提高酶促電極生物感測器之敏感度」 "Development of a New Mediator to Enhance the Sensitivity of Enzyme-Based Electrode Biosensors" jointly developed by Chiayi CGMH and NCIR.	臨床新創獎 Clinical Innovation Award
	國儀中心與花蓮慈濟醫院合作開發「物聯網驅動的藥品閉鎖管理系統：從實時監控到護理減負的創新應用」 "Enhancing Medication Safety and Reducing the Burden on Nursing Staff: Using IoT Technology to Build a Closed-Loop Medication Management System from Hospital Pharmacies to Wards" jointly developed by Hualien Tzu Chi Hospital and NCIR.	臨床新創獎 Clinical Innovation Award

競賽活動 Activities	得獎隊伍 Teams	獲獎項目 Prizes
中華民國計量工程學會 Chinese Metrology Society	先進半導體二維材料之製程檢測、設備研製技術與產業應用 Process Inspection, Equipment Development, and Industrial Applications in the Development of 2D Semiconductor Materials	第 20 屆計量科技研發創意獎 Innovation Award for Metrology Technology Research and Development of the 20th Session
第十六屆 IIIC 國際創新發明競賽 The 16th International Innovation and Invention Competition	A Method for Initial Values of the Thin Film Optical Constants and Thickness Using Artificial Intelligence	金牌 Gold Award
Park Systems Nano Image Challenge 2025	懸浮式二維元件分析 Suspended 2D-material Device	最佳創意實驗影像獎 Creative Experiment Image Award

國儀中心協同學研夥伴獲得多項國家新創獎肯定。
NCIR and its academic partners have secured several prestigious National Innovation Awards.

國儀中心以核心技術創造卓越價值，榮獲「**第十九屆國家實驗研究院傑出科技貢獻獎**」肯定，得獎名單如下：

NCIR cultivates exceptional value through its core technologies and was honored with the "**19th National Institutes of Applied Research Outstanding Science and Technology Contribution Award.**" The awards list is as follows.

「學術發展」佳作—大面積二維材料製程設備與檢測技術

Honorable Mention Award in "Academic Advancement":
Large-Scale 2D Materials Processing Equipment and Inspection Technology

成果說明：

研發團隊致力於建構完整「大面積二維材料製程設備與檢測技術」，以開發新穎低維半導體材料製程設備與技術爲基礎、建立關鍵元件技術與設備爲目標進行前瞻性學術研究，並具高度的服務熱忱，協助國內學術界進行全球頂尖之前沿科技研究。歷年來已獲國科會/經濟部支持執行多件大型計畫，期間發表多篇國際會議及期刊學術論文，獲得多項發明專利與研究補助金額。

Achievements:

The research team is dedicated to establishing a comprehensive "Large-scale 2D Materials Processing Equipment and Inspection Technology." Building on the development of novel low-dimensional semiconductor material processing equipment and techniques, the team conducts forward-looking research to advance critical component technologies and instrumentation. With a strong commitment to service, the team has supported Taiwan's academic community in conducting world-leading research at the forefront of technology. Over the years, the team has received support from NSTC and the Ministry of Economic Affairs to execute multiple large-scale projects. These efforts have resulted in extensive publications in prestigious international conferences and journals, a robust portfolio of patents, and significant research funding.

國研院蔡宏營院長(圖左)頒發獎項給「大面積二維材料製程設備與檢測技術」團隊。
NIAR President Hung-Yin Tsai (left) presented the award to the team of "Large-Area 2D Materials Processing Equipment and Inspection Technology."

「技術發展」佳作—傷口癒合分析之多光譜光源血氧影像偵測技術

Honorable Mention Award in "Technological Development": Multispectral Light Source-Based Blood Oxygen Imaging Technology for Wound Healing Analysis

成果說明：

研研發團隊自 2019 年起，即致力於開發多光譜光源血氧影像應用於傷口癒合監測與評估之技術，所發展之「傷口癒合分析之多光譜光源血氧影像偵測技術」成功建構高精度、多層次的血氧影像偵測平台，並整合光學、機電與影像數據分析技術，提升傷口評估的準確性與即時性，實現創新醫療影像應用。其前瞻創新研發概念獲得多項獎項肯定。

Achievements:

The research team has been committed to developing multispectral imaging technology for blood oxygenation monitoring since 2019. This innovation is specifically designed for the non-invasive assessment and monitoring of wound healing processes. The "Multispectral Light Source-based Blood Oxygen Imaging Technology for Wound Healing Analysis" has successfully established a high-precision multi-layer blood oxygen imaging detection platform. By integrating optical, electro-mechanical, and image data analysis technologies, the system enhances the accuracy and real-time capability of wound assessment, enabling innovative applications in medical imaging.

國研院蔡宏營院長 (圖左) 頒發獎項給「傷口癒合分析之多光譜光源血氧影像偵測技術」團隊。

NIAR President Hung-Yin Tsai (left) presented the award to the team of "Multispectral Light Source-based Blood Oxygen Imaging Technology for Wound Healing Analysis."

NCIR

Advanced Technology Promotion

推動前瞻科技

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

國儀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 年 － 107 年) 與第二期 (108 年 － 109 年) 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 年 － 111 年)、第四期 (112 年 － 113 年) 與第五期 (114 年)「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。

114 年主要成果如下：

- 完成自主研發叢集式臨場檢測設備之整體建置，內容涵蓋拉曼臨場監控模組、自主研發之 *in-situ* XPS 分析模組，建立可即時監測製程狀態之整合式檢測平台，並完成多功能 EUV 微影元件檢測模組之建置與驗證，可針對 EUV 反射鏡、光罩、光阻等關鍵元件與材料進行系統化檢測分析。
- 國儀中心自主研發叢集式臨場檢測技術，突破先進製程材料分析受限於大氣污染與非即時監控的瓶頸，支援國內產學研半導體材料先進檢測技術開發與落地，建立領先的叢集式臨場檢測設備。

With significant experience in R&D and opto-electro-mechanical system integration, NCIR has participated in the Advanced Research Instrumentation Development Service Platform—Phase 1 (2017 – 2018) and Phase 2 (2019 – 2020)—of the Forward-Looking Infrastructure Development Program. It underscores the development of Taiwan's independent production capability for semiconductor processing equipment. In 2021, the NCIR developed *in-situ* inspection of semiconductor equipment while advancing the next generation of semiconductor technology and talent cultivation in Phase 3 (2021 – 2022), Phase 4 (2023 – 2024), and Phase 5 (2025) of the Forward-Looking Infrastructure Development Program, i.e., Digital Development. It initiated *in-situ* measurement while providing data during the process stage. NCIR assists in the domestic development of inspection equipment in Taiwan's semiconductor industry. It supports interdisciplinary talent cultivation for 2D semiconductor material processes and equipment in Taiwan, attracting more talent 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. Taiwan's semiconductor equipment capabilities can be strengthened by integrating upstream, midstream, and downstream technologies.

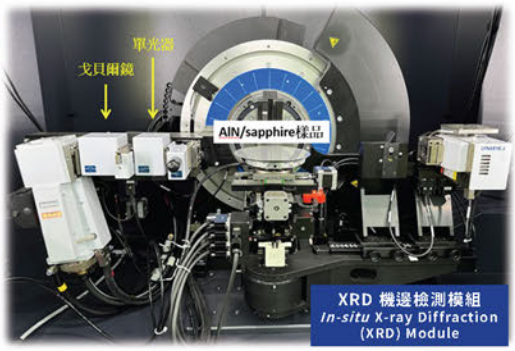
Major Achievements in 2025:

- NCIR has developed an integrated *in-situ* detection platform that combines Raman monitoring with an independently developed XPS analysis module, enabling real-time process monitoring. A multifunctional EUV lithography component detection module has been developed and verified for the systematic testing and analysis of key materials, including reflective mirrors, photomasks, and photoresists.

NCIR's independently developed *in-situ* cluster detection system eliminates analysis bottlenecks caused by atmospheric exposure and non-real-time monitoring in advanced processes. This achievement facilitates the development and implementation of advanced semiconductor material testing technologies within Taiwan's industry-academia-research sectors, fostering the establishment of a world-class *in-situ* cluster detection platform.

12 吋二維材料關鍵臨場檢測設備
12-inch *In-situ* Inspection System for 2D Materials

拉曼臨場檢測模組
In-situ Raman Detection Module



XRD 機邊檢測模組
In-situ X-ray Diffraction (XRD) Module

次奈米極淺層薄膜成分即時監測設備
Real-time Monitoring System for Sub-nanometer Thin Film Composition

快速熱處理模組
Rapid Thermal Processing Furnace (RTP)

淺層薄膜成分即時監測模組
In-situ X-ray Photoelectron Spectroscopy (XPS)

次奈米極淺層薄膜成分即時監測設備
Real-time Monitoring System for Sub-nanometer Thin Film Composition

上圖爲 12 吋二維材料關鍵臨場檢測設備；中圖爲次奈米極淺層薄膜成分即時監測設備；下圖爲多功能的 EUV 微影元件檢測設備。
The image on the top shows the critical 12-inch *in-situ* inspection system for 2D materials; the image in the middle presents real-time monitoring system for sub-nanometer thin film composition; the image on the bottom illustrates multifunctional inspection system for EUV lithography.

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。

114 年主要成果如下：

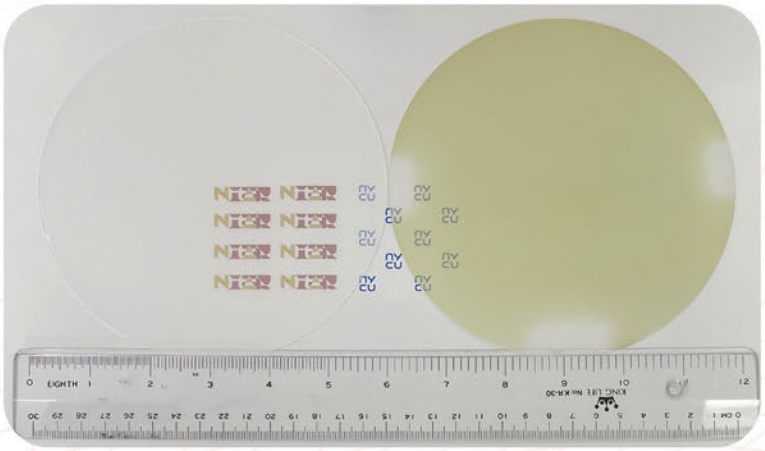
- 完成開發全氣態八吋 MOCVD 系統，使用者可藉由電腦介面變化製程參數與調整機構程式來操控製程程序，包含進氣管路具有分流與匯流選擇性搭配設計，透過模擬輔助製程與晶圓載具優化，實現水平爐管中垂直流生長二維 WS_2 薄膜。
- 透過本計畫團隊研製之二維材料沉積製程系統，已成功於 6 吋晶圓上成長高品質 WS_2 晶體，完成其關鍵物性之驗證，同時驗證其於下世代半導體元件應用之可行性。本成果不僅奠定二維材料於先進半導體製程中的技術基礎，亦進一步開放支援具潛力之學研單位，進行先期材料基礎科學研究，深入探索其於光學、機械、醫療材料等尚未充分開發之應用領域。本計畫成果有助於建立符合先進半導體製程需求的關鍵技術，在科學探索與技術創新的過程中，培育具備創新能力的高階產業人才，進而帶動新興產業發展，並提升整體科技競爭力與人類生活品質。

The Angstrom Semiconductor Initiative is based on Taiwan's localization of semiconductor 2D material processes and equipment. Through collaboration with academic teams and the cultivation of relevant research talent, the team has jointly developed 2D material processes for future semiconductor technologies. The Initiative bridges 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 highlights the development of large-scale equipment and processes for the deposition of 2D materials for "key semiconductor component materials." With a foundation for developing innovative low-dimensional semiconductor material process equipment and technology, and the objective of developing key component technologies and equipment, it unlocks new opportunities for next-generation forward-looking semiconductor equipment and process technologies through low-dimensional materials that challenge physical limits.

Major Achievements in 2025:

- NCIR has successfully developed an all-gas-phase 8-inch MOCVD system, enabling users to control the process via a computer interface by adjusting process parameters in conjunction with mechanical operations. The process includes the inlet piping, designed selectively, with options for flow splitting and merging. With simulation-assisted process and wafer carrier optimization, vertical-flow growth of two-dimensional WS_2 in a horizontal furnace has been achieved.

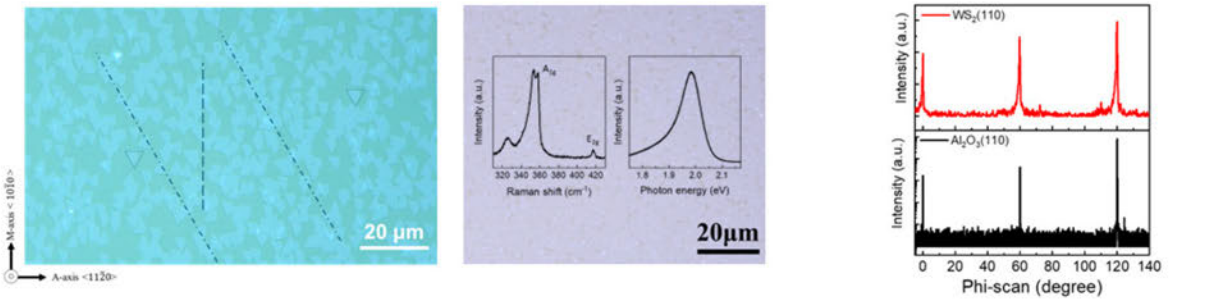
Using the self-developed 2D material deposition system, high-quality WS_2 crystals have been successfully grown on 6-inch wafers. Their key material properties have been verified, and the feasibility of WS_2 for next-generation semiconductor device applications has been demonstrated. This achievement has established a technical foundation for the integration of 2D materials into advanced semiconductor processes, and further supports academic and research institutions in conducting preliminary materials science studies. This can serve as a basis for exploring applications in optics, mechanics, medical materials, and other potential application areas. These outcomes establish key technologies that meet the requirements of advanced semiconductor processes and cultivate high-level industrial talents with innovative capabilities through scientific exploration and technological innovation. This can promote the development of emerging industries and enhance technological competitiveness and quality of life.



八吋 MOCVD 系統架構 (如上圖) 用於在六吋晶圓上成長 WS_2 薄膜 (如下圖)。
8-inch MOCVD system architecture (top) for the growth of WS_2 films on 6-inch wafers (bottom).

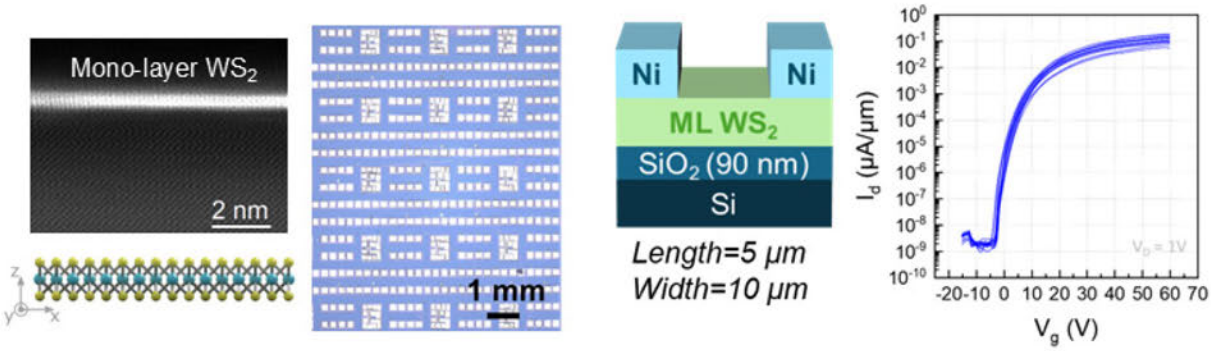
光學顯微鏡影像與拉曼 / 光激發光物理量測
Optical Microscopy and Raman/PL Measurements

面內低略角 X 光方位角掃描
In-plane Grazing Incidence X-ray Phi-Scan



片狀 WS_2 晶體具有特定方向性排列，拉曼特徵峰證實 WS_2 晶體行爲 (圖左)，且直接能隙 ~2eV 符合單層 WS_2 物理性質 (圖中)；X 光方位角掃描驗證單層 WS_2 與氧化鋁基板磊晶關係 (圖右)。

Flake-like WS_2 crystals exhibit a preferential directional arrangement. Raman characteristic peaks confirm the properties of the WS_2 crystals (left). The ~2 eV direct bandgap is consistent with the physical properties of monolayer WS_2 (middle). X-ray ϕ-scans verify the epitaxial relationship between monolayer WS_2 and the Al_2O_3 substrate (right).



穿透式掃描式電子顯微鏡之原子序對比影像顯示單層 WS_2 結構元件應用驗證 I-V 行爲符合半導體元件操作機制。

Atomic number contrast imaging via scanning transmission electron microscopy reveals that the I-V behavior of structural components based on monolayer WS_2 aligns with the operating mechanisms of semiconductor devices.

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

Establishment of an Online AI Training Database and Verification Collaboration Platform for 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國儀中心產線數據外，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。

114 年主要成果如下：

- AI 多型態雲端資料庫共累積 11 種數據集 (含製程 / 環控資料庫)，其數據來自不同加工設備，包括五軸加工機 GT-630 磨削訊號數據集、多軸成形機 Hardinge 磨削訊號數據集、車削定心機溫升熱補償數據集、廠務冰機能耗數據集、過濾泵浦數據集、空氣盒子感測器數據集、超音波加工訊號數據集、超音波加工生成式 AI 模擬數據集、實驗室溫濕度數據集、砂輪磨耗輪廓數據集以及超精密加工製程訊號數據集等。上述於國儀中心產線中之加工製程感測器數據資料與對應之量測結果，其累積數據資料已達 12 TB 以上，其數據資料將可作爲健康診斷、品質預測、磨耗監測、模組測試驗證與製程優化使用。

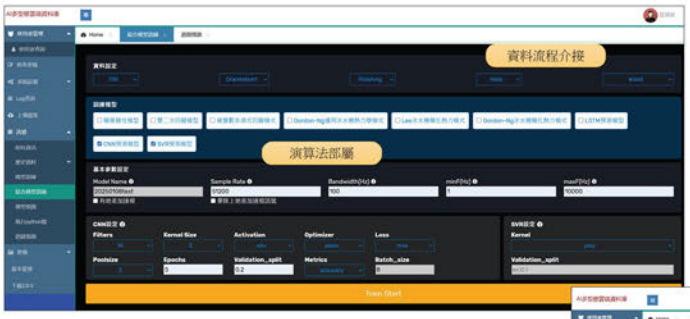
- 使用上述數據集開發 AI 代理模型與演算法，包含 2-order DOE、3-order DOE、XGBoost、LightGBM 與最佳化演算法，最佳化演算法包含粒子群演算法 (PSO)、灰狼優化演算法 (GWO) 與鯨魚演算法 (WOA)，提供光學元件加工品質參數優化預測。
- 本測試驗證場域佈建 5G 訊號節點，導入多感測器整合應用於場域環境監控與異常預警，其偵測資訊從機邊運算 (edge) 至雲端 (cloud)，具備穩定且高速的傳輸環境。同時利用 5G 高頻寬與低延遲優勢，串接場域內的感測數據與 AR / VR 智慧眼鏡，建構出虛實整合的監測介面，讓原本抽象的數據流轉化爲現場人員可視化的輔助資訊，達成人機協作的實質應用。

This project established an integrated online AI training database and an AI deployment verification collaboration platform to support research, development, and validation activities within the academic and scientific communities. The online AI database not only consolidates production-line data from NCIR but also incorporates de-identified experimental datasets contributed by academic research teams and intelligent machinery-related projects. These datasets are systematically structured into a multimodal data repository encompassing diverse manufacturing processes, equipment types, and sensing modalities. This enables users to conduct professional training, develop AI models, and validate algorithm performance using datasets tailored to specific application scenarios. In parallel, the AI deployment verification collaboration platform provides a comprehensive software–hardware integration environment covering design, manufacturing, assembly, and inspection. This platform supports remote and cross-site validation of AI-enabled products and technologies, thereby enhancing system robustness, reliability, and real-world applicability.

Major Achievements in 2025:

- The AI multimode cloud database accumulates 11 datasets, covering both process-related and environmental control databases. These datasets are collected from a wide range of advanced manufacturing equipment, including: (a) grinding signal dataset from 5-axis machining machine "GT-630"; (b) grinding signal dataset from multi-axis forming machine "Hardinge"; (c) thermal drift and compensation datasets from turning and centering machines; (d) energy consumption dataset from facility chiller systems; (e) filter pump dataset; (f) airbox sensor datasets; (g) ultrasonic processing signal datasets; (h) generative AI simulation datasets for ultrasonic machining processes; (i) laboratory temperature and humidity datasets; (j) grinding wheel wear profile datasets; and (k) ultra-precision machining process signal datasets. The cumulative volume of process sensor data and corresponding measurement results collected from NCIR production lines has exceeded 12 TB. These datasets provide a critical foundation for applications such as health diagnostics, quality prediction, wear monitoring, module validation, and process optimization.
- These datasets are utilized to develop AI agent models and optimization algorithms, including second- and third-order Design of Experiments (DOE) models, machine learning algorithms such as XGBoost and LightGBM, and optimization algorithms such as Particle Swarm Optimization (PSO), Grey Wolf Optimizer (GWO), and Whale Optimization Algorithm (WOA). These methods enable the prediction and optimization of quality parameters in optical component processing.
- A 5G-enabled test and validation environment has been established, incorporating multi-sensor integration for real-time environmental monitoring and anomaly

detection. Data collected at the equipment level (edge) are transmitted seamlessly to cloud systems (cloud), ensuring stable, high-speed, and low-latency communication. Furthermore, by leveraging 5G capabilities, sensing data are integrated with AR / VR smart glasses to create a cyber-physical monitoring interface. This approach transforms abstract data streams into intuitive, visualized information for on-site personnel, thereby enabling effective human–machine collaboration and improving operational decision-making.



AI 雲端資料庫
AI cloud database

製程狀態與異常警示的可視化輔助
Visualization of process status and anomaly alerts

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。

114 年主要成果如下：

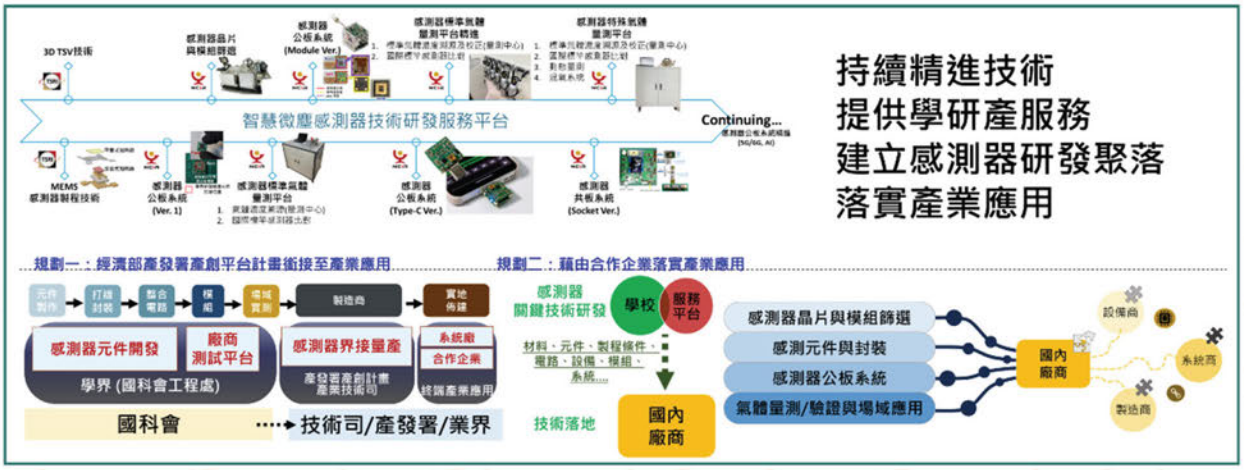
- 建立感測元件製造、感測器公板、標準氣體量測、驗證及測試平台等一條龍服務，且自主研發具備微小化與低功耗特性之氣體感測器技術，並提供國內外學研單位自主研發感測器研發、測試及驗證服務，可與國際標竿企業感測器進行平行比對。該平台將持續維運並提供各類感測器相關技術落實並擴展至百工百業應用，達成感測元件模組國產化、自主化技術能量目標。
- 與學界研究團隊共同完成感測器佈建於民生、業界及特殊場域應用，從水利局汙水處理廠、環保部標準測站、半導體製程場域到智慧城市應用總計 33 個不同實際場域，促進所開發感測器之落地應用與實質導入，更實現從感測器開發到場域驗證應用之跨部會鏈結。
- 本計畫積極辦理各項技術推廣活動及參加會議展覽，亦於各項科普活動推廣學研團隊感測技術成果，提升團隊技術能見度，以強化學術成果與產業應用之鏈結，發揮計畫推動的整體效益。計畫產業鏈結與應用衍生伸成果如下述：9 件技術移轉案，合計金額 374 萬元；專利共獲取 14 件，成功申請經濟部價創 2.0 計畫及 SBIR 計畫，及其他衍伸合作案達 19 件合計 754 萬元。
- 參與本計畫之高雄科技大學蕭育仁教授團隊亦通過經濟部「學研合作創新創業計畫」，透過 MEMS 半導體氣體感測器技術移轉，成立國內首家氣體感測晶片新創公司，實現學研成果商品化與產業落地，有效促進研發成果產業化與推動感測技術創新之實質效益。

This project established a comprehensive R&D service platform for smart dust gas sensing technologies, providing integrated support that includes customer reference boards (CRBs), sensor chip and module screening, device and module validation, as well as industry–academia collaboration matchmaking. The platform serves as a critical technology backbone for academic research, enabling the development of indigenous sensor technologies and strengthening national capabilities in sensor innovation.

Major Achievements in 2025:

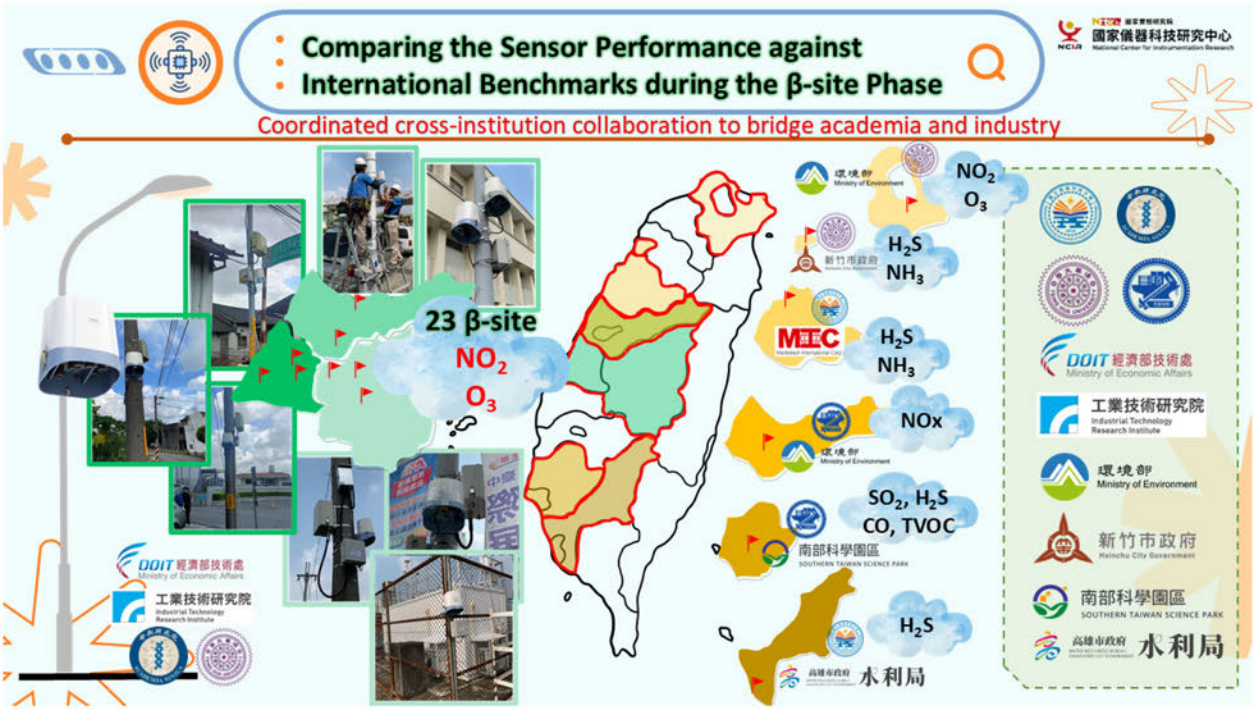
- NCIR has established a one-stop service platform encompassing sensor component fabrication, CRB development, standard gas measurement, validation, and testing. The project has independently developed gas sensing technologies featuring miniaturization and low power consumption, and provides comprehensive R&D, testing, and verification services to both domestic and international academic and research institutions. The platform enables parallel benchmarking against leading international sensor technologies, ensuring performance alignment with global standards. It continues to operate as a core infrastructure for advancing sensor technology applications across diverse sectors, supporting the realization of localized production and technological autonomy in sensor modules.

- In collaboration with academic research teams, sensor systems have been deployed at 33 real-world sites, across public infrastructure, and specialized domains. These include sewage treatment plants operated by the Water Resources Bureau, standard monitoring stations under the Ministry of Environment, semiconductor manufacturing environments, to smart city applications. NCIR promotes the practical deployment and integration of developed sensors, enabling cross-ministerial collaboration from sensor development through field validation to real-world implementation.
- The project actively promotes its technologies through participation in conferences, exhibitions, and science outreach activities, enhancing the visibility of sensing technologies developed by academic teams while strengthening the linkage between research and industrial applications. The project's industry linkages and derivative applications have yielded the following results: 9 technology transfer cases totaling NTD 3.74 million; 14 patents granted; successful acquisition of funding through the Ministry of Economic Affairs' Value Creation 2.0 Program and SBIR Program; and 19 additional collaborative projects generating NTD 7.54 million.
- The research team led by Professor Yu-Jen Hsiao from National Kaohsiung University of Science and Technology participating in this project has also established Taiwan's first gas-sensing-chip startup company through the Ministry of Economic Affairs' Academic-Industry Innovation and Entrepreneurship Program. By transferring MEMS-based semiconductor gas sensor technologies, the team achieved the commercialization of academic research and facilitated the industrial deployment of advanced sensing technologies. This milestone represents a significant step toward bridging academic innovation with industrial application, while also delivering tangible impact in promoting the advancement of sensor technology.



感測器服務平台提供產學研界技術服務，建立感測器研發聚落。

The sensor service platform provides technical services to the industry-academia-research community, while a sensor R&D cluster has been established.



本計畫跨部會鏈結，建立北中南實體驗證場域。

This project brings together multiple ministries to establish physical verification sites across north, central, and south Taiwan.

建置器官晶片試生產服務平台

Constructing a Trial Production Service Platform for Organ-on-a-Chip Optimization

因應替代動物科技試驗 (alternatives to animal testing) 的國際發展趨勢，本計畫建構器官晶片試生產及製程標準化平台，提供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。本平台輔助學研團隊將前瞻研究成果進一步完成商化應用銜接的準備，以加速生醫研究效率，並達動物實驗減量之目標。

114 年主要成果如下：

- 擴充器官晶片試生產平台服務能量，完成器官晶片氣體與液體壓力耐受性測試系統建置，可提供團隊晶片性能測試與製程參數調整；完成超音波熔接系統建置與製程參數優化，已提供團隊器官晶片超音波熔接製程服務；完成器官晶片微環境水凝膠強度測試標準程序 (SOP) 建置與膠體強度試驗，可作爲器官晶片材料驗證流程基礎；建構感測晶片整合技術能量，已完成生物晶片與壓力感測器的整合對位設計、製作與前期驗證測試，可作爲後續仿腎元晶片中製造不同壓力差的作動機制參考。
- 依據「委託國研院試製及驗證流程」，114 年度生物晶片試生產平台已提供學研團隊有關器官晶片試製、試生產或測試服務共計 5 案，協助學研團隊雛型品往商品推進。各案服務成果分述如下：
  1. 血栓晶片：完成試生產規格制訂與模具製作，並提供團隊約 40 組晶片測試樣本進行細胞培養測試，完成 500 片血栓晶片試生產。
  2. 腫瘤體外培養系統平台之腫瘤血管晶片：完成試生產規格制訂、模具製作與及晶片製程參數調校等，並完成 20 組腫瘤血管晶片工程品試製以及 100 組元件製作。

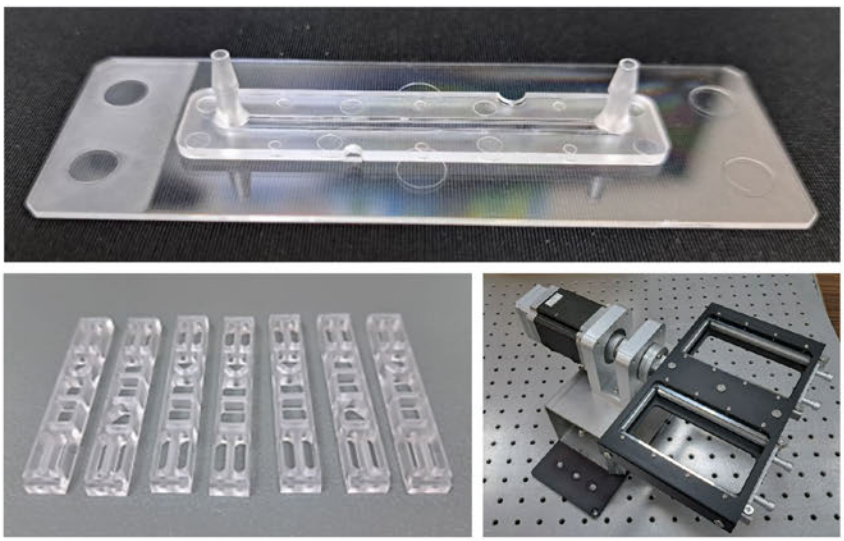
3. 腫瘤體外培養系統平台之腫瘤組織抓取裝置：完成試生產規格制訂與模具製作，並完成腫瘤抓取裝置工程品 20 組試製以及 200 組元件製作。
4. 腫瘤體外培養系統平台之離心裝置：完成試製規格制訂、離心機本體製作與功能測試，並完成離心晶片夾持機構、晶片培養置放機構與腫瘤晶片組配測試，提供 1 套符合團隊需求的客製離心裝置。
5. 複合器官晶片：完成裝置拔脫應力測試。

Responding to the international development trend toward alternatives to animal testing, we developed a platform to standardize the trial production and processes for organ-on-a-chip. It provides engineering solutions for organ-on-a-chip from concept to practical application specifications. This ensures product functionality, usability, and compliance. The platform assists academic and research teams in translating cutting-edge research outcomes into commercial applications, enhancing the efficiency of biomedical research, and reducing the need for animal experiments.

Major Achievements in 2025:

- NCIR has extended the service capabilities of the organ-on-a-chip pilot production platform and completed the establishment of gas and liquid pressure tolerance testing systems for organ chips. Thus, it can provide teams with chip performance testing and process parameter adjustments. The ultrasonic welding system was established with optimized process parameters. It is now available to support teams with ultrasonic welding process services for organ chips. The Standard Operating Procedure (SOP) for hydrogel mechanical strength testing in the chip's microenvironment was developed. Gel strength experiments were conducted, which may serve as the basis for material validation processes for organ chips. The sensing chip integration technology has been developed. The alignment design, fabrication, and preliminary validation testing of the integration of biochips and pressure sensors have also been completed. This achievement serves as a reference for actuating mechanisms with pressure differences in subsequent kidney-on-a-chip manufacturing.
- In accordance with the commissioned trial production and verification processes conducted by the NIAR, the Trial Production Service Platform has provided academic and research teams with services including organ-on-a-chip trial production, pilot production, and testing in 2025, supporting a total of five projects. The outcomes of each service project are detailed as follows:
  1. Thrombosis-on-a-chip: completed the establishment of trial production specifications and mold fabrication. Approximately 40 sets of chip samples were provided for cell culture testing, and a total of 500 thrombosis-on-a-chip devices were produced through pilot production.
  2. Vascularized tumor-on-a-chip: completed trial production specifications, mold fabrication, and process parameter optimization. A total of 20 engineering prototypes of tumor vasculature chips were produced, along with 100 sets of components.
  3. Tumor tissue capture device: completed trial production specifications and mold fabrication. A total of 20 engineering prototypes and 200 sets of components were fabricated.

4. Centrifuge device: completed trial production specifications, fabrication of the centrifuge body, and functional testing. Additionally, chip clamping mechanisms, chip culture placement modules, and assembly testing for tumor chips were completed. One customized centrifugal device meeting team requirements was delivered.
5. Multi-organ-on-a-chip: completed the device pull-off stress testing.



器官晶片試生產服務平台服務成果列舉：血栓晶片 (上)、腫瘤血管晶片 (下左) 以及客製規格離心裝置 (下右)。
Examples of service achievements of the organ-on-a-chip trial production service platform: thrombosis chip (top), tumor vascular chip (bottom left), and customized centrifugal device (bottom right).

International Cooperation

國際合作

國儀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國儀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，提升國儀中心研究水準。

NCIR 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, NCIR is dedicated to promoting international collaboration. To increase our global reputation, NCIR actively participates in international conferences/exhibitions and visits international organizations. Meanwhile, internationally renowned scholars and outstanding professionals are also invited to visit NCIR. This year NCIR continuously interacts with partners via multiple access. It has always been NCIR's pursuit to keep interaction with global instrumentation societies, cultivate excellent R&D talents, and advance R&D level.

參與「臺歐半導體短期培訓計畫」歐陸研發人才至國儀中心參訪交流。
Researchers of "Taiwan-Europe Semiconductor Short-term Training Program" visit NCIR.

日本鳥取大學 Sang-Seok Lee 教授及東北大學 Yukio Suzuki 教授與中心研究人員交流並分享微機電 (Micro-Electro-Mechanical Systems, MEMS) 相關技術及應用。
Prof. Sang-Seok Lee from Tottori University and Prof. Yukio Suzuki from Tohoku University visit NCIR and share their expertise on MEMS.

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，國儀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 NIAR is to establish a global and world-class R&D service platform. NCIR 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, NCIR 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	利用立體超材料結構達成具前瞻性之高指向性、異向性及方向可調控之紅外線光學天線元件。 An innovative Mid-Infrared antenna based on three dimensional metamaterials to achieve highly directive, anisotropic and radiation angle-tunable modulation.
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, Republic of 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

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

為將技術能量推廣至國際，國儀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**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，國儀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**等國際組織之會務活動，國儀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 I^2MTC，以「Sensors Related Technologies for AIoT Applications」爲題的分項議題，發揮臺灣在全球科技的影響力。並透過 IEEE IMS 臺北支會推薦 2024 年「國研盃 *i*-ONE 儀器科技創新競賽」專上組首獎清華大學團隊赴德國參與 IEEE IMS 學會主辦之 2025 全球學生競賽 (International IMS Student Contest)，榮獲第二名佳績。同時，國儀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。

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

On the other hand, NCIR 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, NCIR has gradually established and 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 NCIR and domestic academia. Every year, NCIR 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 NCIR and Taiwan. In 2025, NCIR organized a Special Session, titled "Sensors Related Technologies for AIoT Applications," at I^2MTC in Chemnitz, Germany, attracting researchers in the field to have efficient discussion on the topic. On the other hand, recommended through IEEE IMS Taipei Chapter, the college & above group winner of 2025 NIAR *i*-ONE Instrument Technology Innovation Competition, National Tsing Hua University (NTHU) team, participated in the 2025 International IMS Student Contest, receiving the 2nd prize. It is benefit to increase domestic scholars' influence on the promotion of instrumentation, measurement, standard formulation and so forth.

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 (I²MTC)，參與學會核心議題討論並推廣中心技術服務。

NCIR researchers participate in the IEEE International Instrumentation and Measurement Technology Conference (I²MTC), the annually flagship conference of IEEE IMS, and make oral presentation on the latest research results, promoting NCIR's capability and service.

2024年「國研盃 *i*-ONE 儀器科技創新競賽」專上組首獎的清華大學團隊，經由 IMS 臺北支會推薦，參與 International IMS Student Contest 榮獲第二名佳績。

Recommended through IEEE IMS Taipei Chapter, the college & above group winner of 2024 *i*-ONE, the NTHU team, participated in the International IMS Student Contest, receiving the 2nd prize.

Technical Services

技術服務

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，國儀中心秉持支援學術研究、服務產業界爲宗旨，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，114 年提供產學研各界檢測與委製服務累計共 2,042 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 NCIR constantly developed its own instrumentation technologies, but also in compliance with the goal of supporting academic research and serving industry professionals, NCIR provides OEM and calibration services for vacuum equipment, optical systems, and key components. In 2025 NCIR provides a total of 2,042 testing and OEM services to enterprises, universities and research institutes. NCIR 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，國儀中心是臺灣學術界的最佳夥伴與技術支援。114 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 NCIR the best ally and driving force for academia in Taiwan. There are a lot of projects for academia in 2025, only some of whom are listed below.

計畫名稱 Project Title

A 世代半導體專案計畫
Angstrom Semiconductor Initiative Project

合作對象 Partner

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

合作對象 Partner

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

合作對象 Partner

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

合作對象 Partner

國立成功大學、國立臺灣科技大學

National Cheng Kung University、National Taiwan University of Science and Technology

自動化幹細胞培養與分化系統
Automated Stem Cell Cultivation System

合作對象 Partner

國立陽明交通大學

National Yang Ming Chiao Tung University

高眞空濺鍍磊晶系統開發
High-Vacuum Sputtering Epitaxy System

合作對象 Partner

中央研究院

Academia Sinica

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

國儀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。114 年產界合約案件數繁多，僅列舉部分於下。

Aiming to localize the instrumentation technology, NCIR promotes its R&D capability actively and encourages its teams to respond to the industrial demands. Through industry-academia-research cooperation, NCIR 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 2025, 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

國儀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。

國儀中心所提供的 TAF 校正與測試服務項目詳列於國儀中心官網：https://www.ncir.niar.org.tw/Service/Taf，動態更新相關檢校項目。

NCIR has established and kept maintaining ISO/IEC 17025 Calibration Laboratories to provide standard vacuum calibration. The ISO/IEC 17025 calibration and testing service items are shown on the NCIR website: https://www.ncir.niar.org.tw/Service/Taf.

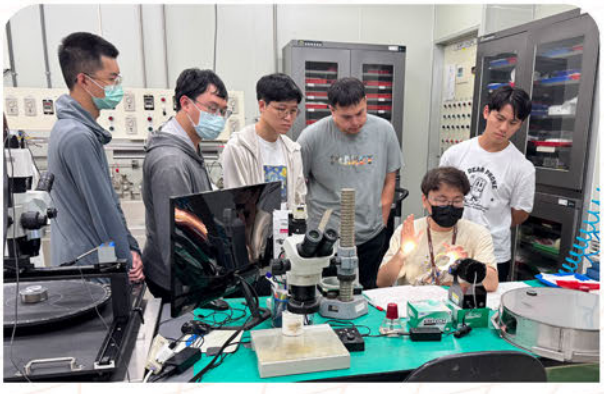
人才培育
Talent Cultivation

國儀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；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。

國儀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。114 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。

NCIR has multiple channels to cultivate outstanding professional talents for domestic academia in instrument-oriented field. First of all, NCIR opens **research program for graduates, NIAR Summer Internship Program** for master and Ph.D. students. Second, NCIR launches student instrument competitions and popular science activities while opening for teaching-oriented visiting requests for young talents. Furthermore, NCIR 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.

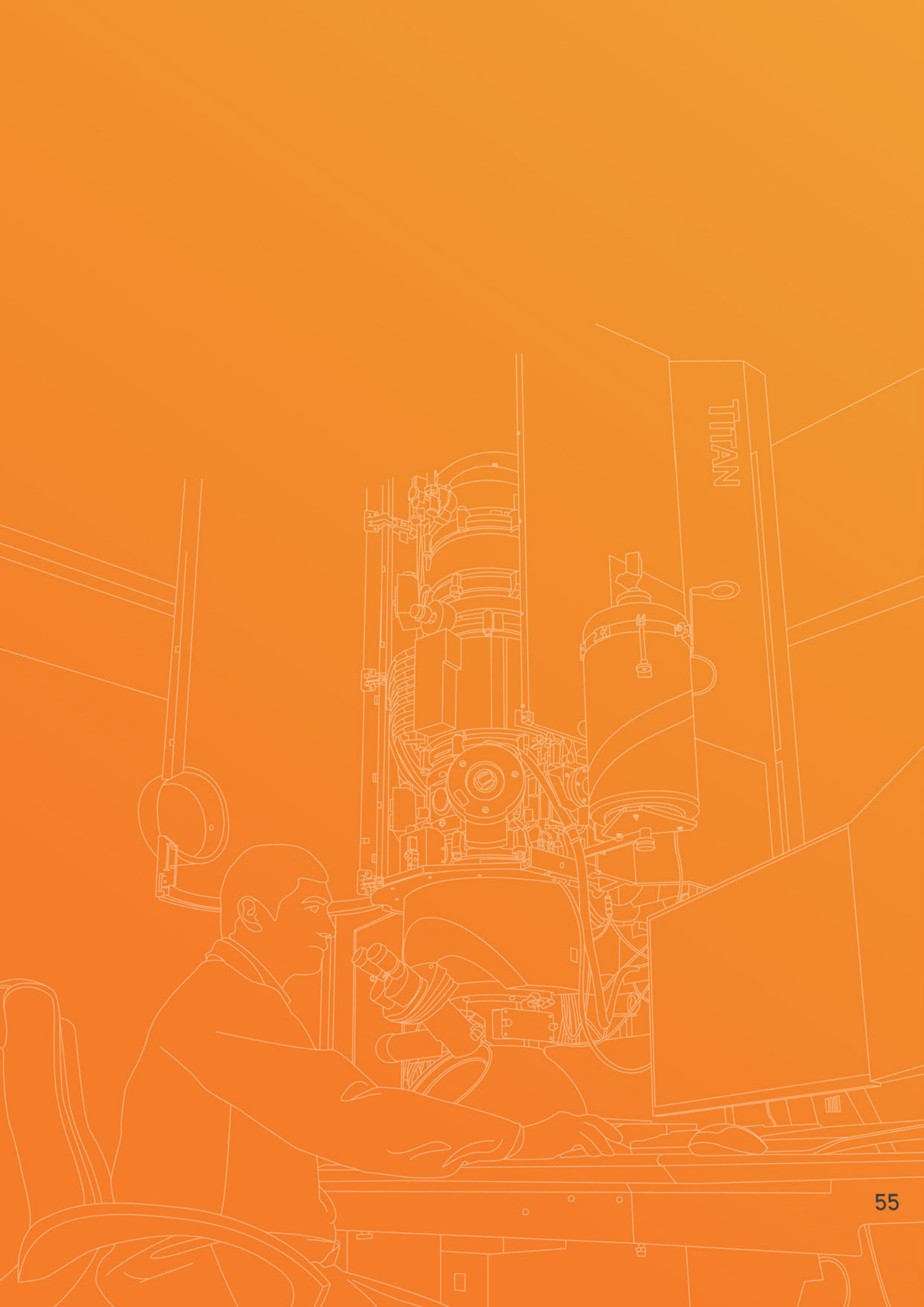
There are many workshops and seminars organized in 2025, including "Workshop on Practical Vacuum Technology", "Instrument Training Course", "ALD/ALE Equipment Development Workshop", and "Teacher Training Course for Semiconductor Manufacturing Process & Equipment". What's more, NCIR opened multiple major training courses for high level industrial professional cultivation. NCIR 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.



國儀中心開辦各種專業研訓課程與研討會，培育國家科研基礎人才。
NCIR has cultivated outstanding professional talents for domestic academia via various workshops and seminars.

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, NCIR hosted various popular science activities to promote instrumentation and technology for young generation.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國家儀器科技研究中心
儀器科技人才培育

01 i-ONE 國研盃儀器科技創新獎
NIAR Instrument Technology Innovation Competition

國儀中心自 2009 年創辦「國研盃 *i*-ONE 儀器科技創新獎」，培育儀器自製人才，不限定徵件作品主題，鼓勵青年學子運用基礎科學知識，發揮其創想，實現儀器研究創新能力，是新創儀器 Maker 大放異彩的舞台，最高獎金 10 萬元。

活動官網：
https://i-one.org.tw/

02 國研盃 智慧機械競賽 ASME Taiwan SDC

國儀中心自 2014 年協同美國機械工程師學會 (ASME) 台灣分會於每年三月間舉辦智慧機器人競賽，設計競賽主題由 ASME 美國總會訂定，競賽題目多元且務實，參賽學生須對機械技術進行創意發想及功能整合，此為 ASME 全球性活動，與國際同步。

活動官網：
https://www.ncir.niar.org.tw/ASME/

03 科儀新知 INSTRUMENTS TODAY 季刊

科儀新知

隨心所欲‧追求新知
《科儀新知》APP

創立於 1979 年，自 2019 年起改以電子期刊方式發行，2020 年推出《科儀新知》APP，以擴大服務讀者的便利性。每期皆有特定專題介紹與人物專訪，聚焦在介紹最新科學儀器與技術、儀器相關元組件與技術、或技術新知的刊物，目標讀者為大專程度以上具理工背景的學生與專家學者。

期刊官網：https://www.ncir.niar.org.tw/Publication/InstTdy
人物專訪：https://www.ncir.niar.org.tw/Publication/People

期刊官網　人物專訪

www.ncir.niar.org.tw

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