2020

Taiwan
Instrument
Research
Institute

儀科中心109年報

ANNUAL REPORT

109 年儀科中心年報
TIRI Annual Report 2020

目錄 Contents

主任的話
Words from Director General

回顧 109 年，全球雖受新型冠狀病毒 (COVID-19) 疫情影響，因台灣積極控制疫情，儀科中心配合政府政策，嚴守防疫規定，並搭配線上溝通軟體與平台，盡可能地維持對外溝通與交流，順利與日本獨立行政法人理化學研究所 (RIKEN) 完成為期五年的 MOU 續簽儀式，且共同發表前瞻三維超穎材料領域的國際頂尖期刊論文，持續強化國際科技與交流研究能量。

儀科中心配合國家政策推動高階關鍵儀器設備之自主研發與應用，發表國內第一台自製之 3D 封裝用步進式曝光機系統與國際領先之原子層蝕刻 (ALE) 設備，已成功製作並驗證 GaN 元件特性。同時，採取「學術合夥人」的策略，積極加強與學術界之間的鏈結，透過共同研究專案及指導學生，增進與學研界之間的拜訪及互動討論時間，深切了解學界對於儀器的獨特需求，協助學術界理工醫農藝術各領域，打造實現前瞻研究所需之客製化特殊實驗儀器設備，如大口徑高解析光學顯微物鏡、電漿原子層蝕刻 / 沉積系統、醫療用同軸手術頭燈、內置推掃式高光譜顯微系統等，協助促成最新穎的基礎科學發現；並與學界共同推動「智慧機械聯網平台」專案計畫，已協助 66 個團隊完成技術發展與驗證、以及「智慧機械感測器服務平台」跨 5 校 6 團隊的專案計畫，加值學界感測器技術，縮短學研與產業應用落差。

本中心積極鏈結學、研、產各界之生醫、半導體、光電等技術能量，進階媒介學界成果產業化，創造更大之社會效益。以長期服務學研界的智能光學量檢測儀器與 ALD 系統之技術能量，擴散學研成果至光電與半導體產業，不但協助上銀集團生產之太陽能板良率提高至 99.2%，遠高於 75% ~ 80% 的全球平均值，且一片太陽能板檢測時間從 30 分鐘縮短到 1 分鐘，大幅提升生產效能和品質；更與天虹科技股份有限公司合作，共同開發市場行情上億元的 12 吋量產型叢集式 ALD 設備，降低前驅物消耗量設計與相對高產出速度，再創台灣自製高階半導體設備里程碑。

除此之外，在國際醫療器材認證一站式服務平台上成績斐然，透過「國研醫材創價聯盟」統整產學研界能量，參與科技部法人鏈結計畫，協助成功大學吳炳慶教授團隊「牙周病菌即時靈敏檢測平台」案源技術移轉予台灣尖端先進生技醫藥 (股) 公司，金額達 880 萬元，加速學研成果商化轉譯；整合產學研醫六單位研發能量，促成合作開發全球首例的「智慧化關節炎分型與精準細胞治療」創新產品；協助新創公司開發之「血液減除白血球過濾膜」、「醫療用鋰電池」分別順利取得歐盟 CE 認證及 ISO 13485 認證，助益產品接軌國際市場；並配合政府新南向政策鏈結東南亞國家，延續與泰國國家發展局 (NSTDA) 下 BIOTEC-IBST 實驗室合作「精準醫療之快速基因檢測」計畫；且成功爭取新加坡國立大學國際標案，協助國際團隊完成 3D 列印客製化牙植體之功能與安全性驗證，展現扶植生醫新創之優質研發服務能量。

邁入 110 年，儀科中心作為「台灣關鍵儀器研發重鎮」，持續聚焦於「前瞻光學」、「先進真空」與「智慧生醫」關鍵技術開發，積極研發「台灣第一」、「國際領先」的下世代半導體製程與設備、尖端國防與太空酬載系統及防疫相關儀器，並打造學術智慧機械實測場域與驗證平台，強化新世代太空、人工智慧、5G、資安、物聯網等前瞻科技應用，橋接學界研發創意與產業需求，建構台灣學界與產業儀器設備自主化的能量，創造高值經濟，帶動國內創新發展與提升世人的生活品質。

The COVID-19 pandemic had a great impact on the world in 2020. Taiwan's condition is relatively more stable due to prospective prevention and control measures. For prevention of COVID-19, Taiwan Instrument Research Institute (TIRI) adopted online communication software and platforms to maintain communications and exchanges with the world as best as possible. Through it all, TIRI successfully signed a **renewal of MOU for five years with RIKEN of Japan**, and jointly published international top journal papers in the field of advanced **three-dimensional metamaterials**. TIRI continuously remained to engage in international science and technology research and exchange.

In line with government policy priorities, TIRI committed to promoting research, development, and applications of high-end key instruments in Taiwan. We are proud to introduce Taiwan's **first in-house lithography stepper** for semiconductor advanced packaging and the world's leading **atomic layer etching (ALE) equipment**. In addition, we also successfully manufactured and verified the characteristics of high-power **GaN devices** to improve research results in the semiconductor field in the future.

TIRI, in partnership with "academic partners", provided training and customized equipment for cutting-edge technology research through the technical cooperation programs, such as **large-aperture high-resolution optical microscopic objective lens, plasma atomic layer etching/deposition systems, medical LED coaxial surgical headlight, snapshot microscopic hyperspectral imaging system**, etc., to promote the most novel scientific discovery. In addition, **"Intelligent Machinery Networking Platform"** was launched to share knowledge and best practices and assisted 66 teams to complete the technical development and verification. "Intelligent Machinery Sensors Service Platform", including six teams from five universities, added value to academic sensor technology, and shortened the gap between academic research and industrial application.

Support provided to academia, research and industry for the fields of biomedicine, semiconductors, and optoelectronics has been TIRI's main technical mission. TIRI actively links the capacities of numerous domestic institutions in the areas to create greater social benefits. TIRI has always prided itself as an organization which serves the academic and research institutes with intelligent optical inspection instruments and ALD systems. Many companies in photoelectric and semiconductor industries have

benefited from the service. For example, **the yield of solar panels produced by Eterbright Solar Corporation under HIWIN has increased to 99.2%**, which is far higher than the global average of 75%-80%, and the detection time has been shortened from 30 minutes to 1 minute per panel, greatly improving production efficiency and quality. In addition, Skytech Inc. successfully developed **12-inch mass production cluster ALD equipment** with a market price of hundred million NTD. The ALD, which requires less precursor consumption and gives relatively higher production throughput, is another milestone for Taiwan's self-developed advanced semiconductor equipment.

The platform, **"NARLabs Medical Device Alliance"**, providing one-stop service, has made great achievements for international medical device verification. It was established to integrate the capability of industry, universities, and research institutes while participating in the "Academia-Industry Collaboration by Research Institutes Project" of the Ministry of Science and Technology (MOST). For example, through the platform, TIRI assisted Dr. Ping-Ching Wu's team from National Cheng Kung University in the technology transfer of **"Real-Time Sensitivity Testing Platform for Periodontal Disease"** to Taiwan Advance Bio-Pharmaceutical Inc. (TABP) with an amount of NT$8.8 million, thus accelerating the commercialization of academic research results. Additionally, development of the world's first **"Intelligent Arthritis Typing and Precise Cell Therapy"**, completion of EU CE certification and ISO 13485 certification for **"Blood Leukocyte Reduction Filter Membrane" and "Medical Lithium-ion Battery"** are all accomplished with six units' R&D capability from the industry, universities, and research institutes under the "NARLabs Medical Device Alliance" platform, which assists from startups to connecting global market.

On the other hand, in line with government's new southbound policy, TIRI has further cooperated with BIOTEC-IBST laboratory under the National Science and Technology Development Agency (NSTDA) of **Thailand** in the **"Rapid Genetic Testing for Precision Medicine"** project, and has established a closer

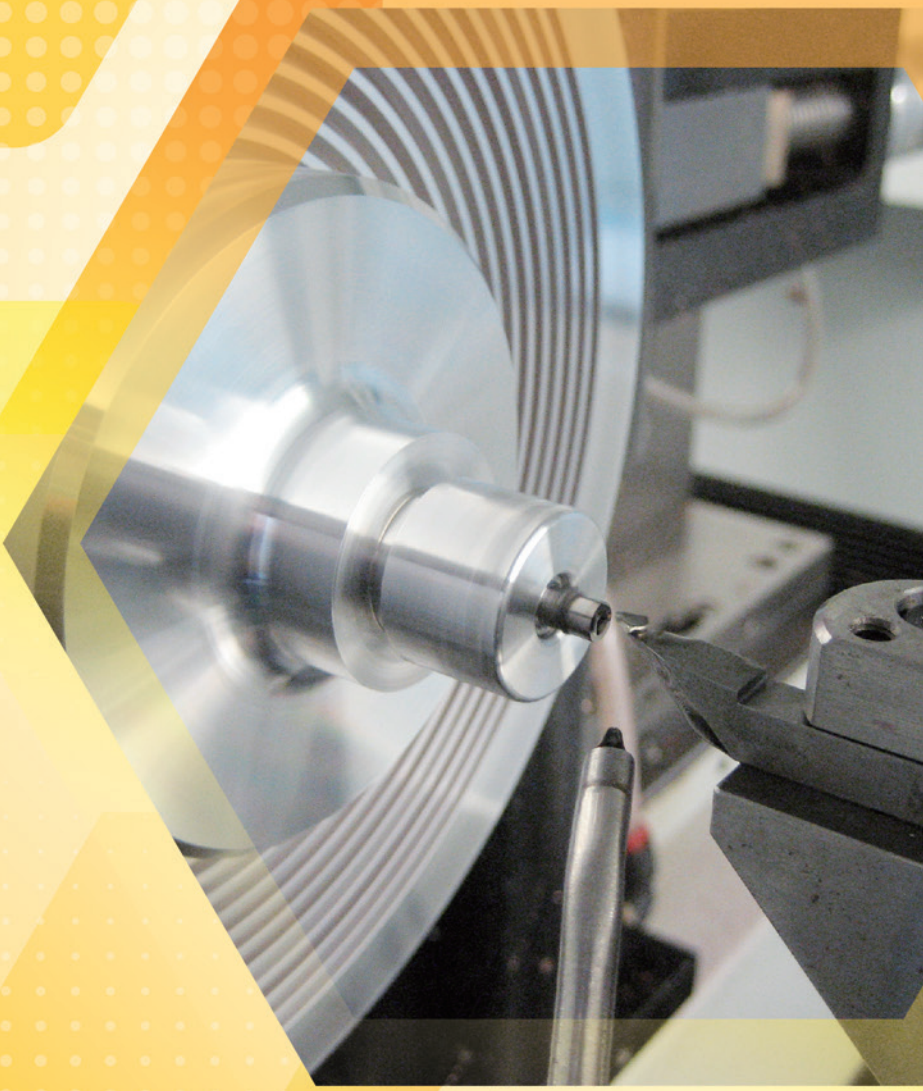
international partnership. Furthermore, we successfully won the **international bid from National University of Singapore**, assisting to complete the **function and safety verification of customized dental implants 3D printing**, fully demonstrating TIRI's high-quality R&D service capability.

Looking ahead to 2021 and beyond, TIRI will continuously focus on the development of key technologies for **"advanced optics", "advanced vacuum"**, and **"smart biomedicine"**. As **a leading R&D institute for key instruments in Taiwan,** TIRI's top priority continues to be focused on the research and development of "No. 1 in Taiwan" & "world-leading" next generation semiconductor equipment, cutting-edge national defense, spaceborne remote sensing systems, and anti-epidemic related instruments. With initiative like "experimental testing field and verification platform for academic intelligent machinery", TIRI is capable of bridging the academic R&D creativity and industrial needs to strengthen the application of new technologies for next-generation space, artificial intelligence, 5G, information security, and Internet of Things.

TIRI will take a leading role in providing the instruments and equipment development localization capability to domestic academia and industry, and deliver the vision of creating a high value-added economy, driving domestic innovation & development, and then improving the life wellbeing of the world.

主任 Director General 楊燿州

Taiwan Instrument Research Institute

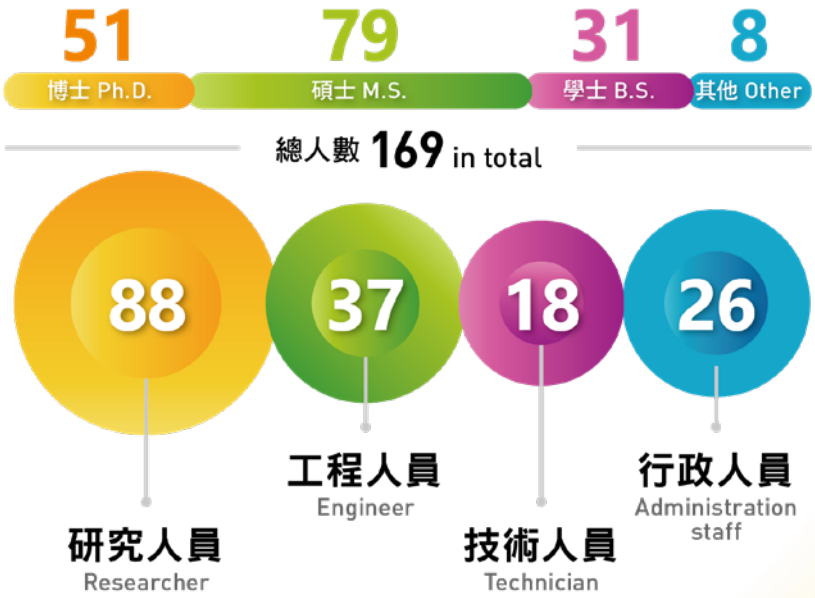


基本概況

Overview of TIRI

組織架構 Organization Chart

人力配置 Deployment of Manpower



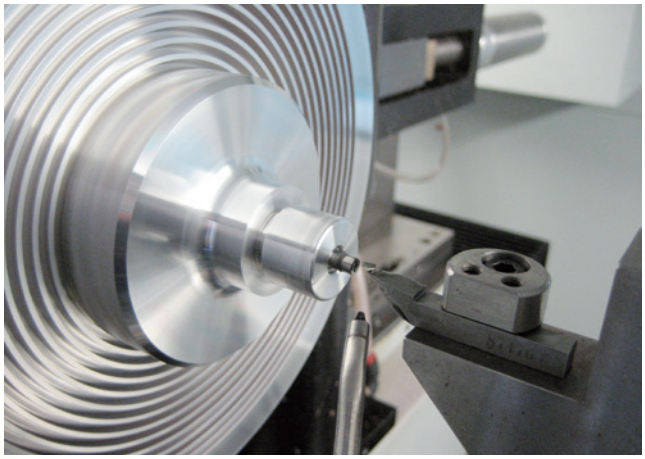
核心設施 Core Facilities

(1) 精密光機工程 Precision Opto-mechanical Engineering

超過 45 年精密光學製造技術，提供精密光機元件及系統設計製作服務，為國內唯一可提供大口徑非球面鏡面加工的單位。

Having accumulated 45 years of experience in precision optics and machining, TIRI provides precision opto-mechanical device and system design & manufacturing services. We are the only organization that can provide fabricating service for meter-scale aspheric optics in Taiwan. Our core facilities include :

- 超精密鑽石車削輪磨機 Single Point Diamond Turning, SPDT
- 大口徑 CNC 拋光與檢測設備 Meter-scale CNC Polishing and Inspection
- 磁流體拋光機 Magnetorheological Finishing, MRF
- 非球面拼接式干涉儀 Aspheric Stitching Interferometric Inspection, ASI
- 超高精度三次元輪廓機 Ultrahigh Accurate 3-D Profilometer, UA3P
- 車削定心機 Turning Centering Machine
- 鏡面自由曲面超精密加工機 Freeform Ultra Precision Machining System



(2) 真空技術 & 薄膜製程 Vacuum Technology & Thin Film Process

儀科中心為國內真空技術發源地，專注於先進薄膜製程技術與系統開發，以及真空系統檢校技術，提供先進真空系統開發、薄膜製程發展及檢校服務平台。

TIRI is the origin of domestic vacuum technology. TIRI provides advanced vacuum system development, thin-film process development, and inspection/ calibration service platforms; our major core facilities include :

- 電漿輔助原子層沉積系統 Plasma-Enhanced Atomic Layer Deposition, PE-ALD
- 金屬有機化學氣相沉積系統 Metal Organic Chemical Vapor Deposition, MOCVD
- 深紫外波段光學鍍膜系統 Deep UV Optical Coating System
- 大口徑鏡片鍍膜系統 Meter-scale Optical Coating System
- 脈衝雷射蒸鍍系統 Pulsed Laser Deposition, PLD
- 高功率脈衝磁控濺射系統 High Power Impulse Magnetron Sputtering, HiPIMS
- 離子源輔助磁控濺射系統 Magnetron Sputtering with Ion-assisted Deposition
- 離子束輔助電子槍蒸鍍系統 E-gun with Ion-assisted Deposition
- 像差修正掃描穿透式電子顯微鏡 Aberration Corrected Scanning Transmission Electron Microscope, STEM

(3) 生醫科技研發環境建置 Medical Device Testing & Verification Laboratories

儀科中心於新竹生醫園區建置及維運共通核心實驗室、產品檢測驗證實驗室，並提供醫療器材法規加值、管理系統整合，輔導品質系統建置、輔導申請產品上市許可（歐盟、美國等國家）等軟體服務，主要核心設施包括以下：

TIRI has established and kept maintaining the Medical Device Testing & Verification Laboratories in Hsinchu Biomedical Science Park, which conforms to international medical device regulations. The laboratories provide one-stop shop service to accelerate the medical product launch. The major core facilities include：

- 金屬材料原型打樣系統 Metallic Material Additive Manufacture System
- 生醫複合材料打樣系統 Polymer Material Additive Manufacture System
- 生物力學材料試驗機 Biomechanics Material Testing Machine
- 生物晶片表面改質系統 Biochip Surface Modification System
- 生物分子交互作用分析系統 Bio-molecular Interaction Analysis System
- 高分子醫療輔具原型打樣系統 Polymer Material Additive Manufacture System
- C-arm X 造影系統 Medical C-arm X-ray Imaging System
- 3T 磁振造影系統 3-Tesla Medical Magnetic Resonance Imaging system
- 128 切電腦斷層掃描系統 128-slice Medical Computed Tomography Imaging System

儀科中心核心價值與營運模式
TIRI Core Values and Business Model

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，以作為支援學術研究的堅實後盾，建構台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.

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 science populariztion education (Talent Cultivation)

Taiwan Instrument Research Institute

亮點成果與大事紀要

Notable Achievements & Milestones in 2020

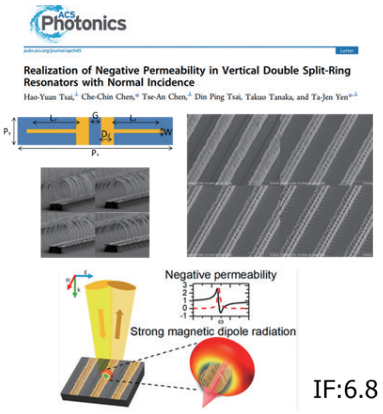
2020 / 01 / 10

台日攜手國際前瞻研究 儀科中心與日本獨立行政法人理化學研究所 (RIKEN) 續簽為期五年合作備忘錄

TIRI and RIKEN renew a five-year memorandum of cooperation for the international cutting edge research

儀科中心與日本獨立行政法人理化學研究所 (RIKEN) 自 93 年起雙方密切互訪交流，於 109 年初完成為期五年合作備忘錄續簽儀式，雙方分別由楊燿州主任與超穎材料實驗室的首席科學家 — 田中拓男博士代表簽署，將持續深化雙方前瞻研究之合作，並共同發表「Realization of Negative Permeability in Vertical Double Split-Ring Resonators with Normal Incidence」研究論文於 ACS Photonics (IF= 6.8) 刊出。

TIRI and RIKEN have exchanged visits since 2014 and completed the renewal ceremony commemorating their five years of cooperation in early 2020. Director Yao-Joe Joseph Yang and Dr. Takuo Tanaka, Chief Scientist of Metamaterials Laboratory, signed the memorandum. The two sides will continue to deepen cooperation in cutting edge research and jointly publish the research paper "Realization of Negative Permeability in Vertical Double Split-Ring Resonators with Normal Incidence" in ACS Photonics (IF = 6.8).



左圖：儀科中心楊燿州主任與日本獨立行政法人理化學研究所 (RIKEN) 超穎材料實驗室的首席科學家 — 田中拓男博士 (Professor Takuo Tanaka, Chief Scientist) 代表雙方續簽五年合作備忘錄；右圖：雙方共同發表學術文章於 ACS Photonics 刊出。

Left: Director Yao-Joe Yang of TIRI and Professor Takuo Tanaka, Chief Scientist of Metamaterials Laboratory of RIKEN, renewed the 5-year cooperation memorandum on behalf of both parties; Right: The two sides jointly published academic articles in ACS Photonics.

2020 / 04 / 21

儀科中心與上銀集團強強聯手 共同研發世界首創「太陽能板產線智慧即時回饋檢測設備」

TIRI and HIWIN jointly develop the world's first "Smart Inspection Equipment with Real-time Feedback for Solar Panel Production Line"

儀科中心與學研界長期深耕智能光學量檢測系統，並擴散學研成果至光電產業，為上銀光電生產線量身訂做、客製開發出「太陽能板產線智慧即時回饋檢測設備」，這套設備整合光學取像系統與高效能運算儲存系統，並結合上銀科技精密定位移動平台及機械手臂，能對長 122 公分、寬 62 公分的大型薄膜太陽能板在 60 秒內完成檢測作業；本設備已通過上銀集團一年的嚴格考驗，符合線上即時檢測的速率要求，且太陽能板良率提高至 99.2%，遠高於 75% — 80% 的全球平均值。

TIRI and the academic research community have been deeply cultivating an intelligent automated optical inspection system for a long time. We applied the research results to the photoelectric industry, and customized "Smart Inspection Equipment with Real-time Feedback for Solar Panel Production Line" for Eterbright Solar Corporation. This equipment integrates the optical imaging system with the high-performance computing storage system and combines the silver technology precision positioning mobile platform with mechanical arm from Hiwin Technology. The operation inspection can be completed within 60 seconds on large thin-film solar panels with the size of 122 cm in length and 62 cm in width. The equipment has passed the strict test of HIWIN for one year and meets the speed requirement of online real-time detection. The yield of solar panels has increased to 99.2%, far higher than the global average of 75%-80%.

左圖：儀科中心與上銀科技共同發表「太陽能板產線智慧即時回饋檢測設備」；右圖：太陽能板產線智慧即時回饋檢測設備穩定性與檢測精確性已通過產線驗證。
Left: TIRI and HIWIN jointly launched "Smart Inspection Equipment with Real-time Feedback for Solar Panel Production Line"; Right: The stability and detection accuracy of the system have been verified by the production line.

2020 / 06 / 18

「科儀新知」推出行動閱讀 APP 學習不設限 儀器新知一手掌握

"Instruments Today" launches an action reading app for learning new knowledge about instruments at one glance

由儀科中心發行出版的「科儀新知」創刊於 68 年，是國內唯一介紹儀器科技相關研究新知、報導最新儀器產品訊息之期刊，儀科中心於 109 年推出「科儀新知 app」，除提升新世代讀者的閱讀便利性，app 設有推播功能，幫助使用者隨時獲得最新的儀器相關訊息與動態；亦可透過分享功能，與親友分享優質文章內容，引領更多讀者了解最新儀器技術發展與脈動，有效傳播科學知識，協助提升國內儀器相關技術，加速推動台灣關鍵儀器設備自主化。

Founded in 1979 and published by TIRI, "Instruments Today" is the only journal in Taiwan that introduces new research knowledge related to instrument science and technology and reports the latest information on instrument products. TIRI launched the "Instruments Today" app in 2020. In addition to improving the reading convenience for the new generation of app readers, the app has a push and broadcast function to help users get the latest information and trends related to instruments at any time. Through the sharing

function, one can also share high-quality article contents with friends, leading more readers to understand the latest instrument technology development and trends. It is expected to effectively disseminate scientific knowledge, help upgrade Taiwan's instrument-related technologies, and accelerate the autonomy of Taiwan's key instruments.

「科儀新知」推出行動閱讀 app 擴大服務讀者和訂閱戶，提升新世代讀者的閱讀便利性。
"Instruments Today" launched a mobile reading app to expand the service for readers and subscribers and to improve the reading convenience of today's new generation.

2020 / 06 / 22

推動智慧機械感測器專案 落實感測器在地化發展
國研院、中山大學與精密機械研究發展中心簽署三方合作協議

Striving for the intelligent mechanical sensor project and implementing the domestic development of sensors
NARLabs, National Sun Yat-sen University, and PMC sign tripartite cooperation agreement

感測器的研發是智慧機械的基礎核心，國研院「AQI 氣體與智慧機械感測器服務平台」整合轄下台灣儀器科技研究中心 (儀科中心) 與台灣半導體研究中心 (半導體中心) 之技術能量，協助學研團隊研發具量產潛能的感測元件與模組，偕同精密機械研究發展中心，以鏟花工藝技術傳承為開端，將中山大學研發中的感測器導入終端產業場域進行檢校與實測，以縮短學研與產業應用落差，共同開創台灣感測器研發聚落，落實感測器自主化與場域測試應用發展契機。

R&D of sensors are the basic core of intelligent machinery. "AQI Gas and Intelligent Machinery Sensors Service Platform" of NARLabs integrates the technical capability of Taiwan Instrument Research Institute (TIRI) and Taiwan Semiconductor Research Institute (TSRI), assisting the research teams to develop sensing components and modules with mass production potential. Beginning with the inheritance of the shoveling process technology, NARLabs works together with PMC to introduce the sensors developed by Sun Yat-sen University into the terminal industry field for calibration and actual measurement, so as to shorten the gap between academic research and industrial application. It also develops sensor clusters in Taiwan and creates opportunities for R&D and testing site applications.

左圖：由中山大學黃義佑副校長（右）、國家實驗研究院吳光鐘院長（中）、精密機械研究發展中心賴永祥總經理（左）代表簽署合作協議；右圖：三方合作協議書簽署儀式大合照。
Left: The cooperation agreement was signed by Vice President I-Yu Huang (right) of National Sun Yat-sen University, Dean Kuang-Chong Wu (middle) of NARLabs, and General Manager Yung-Hsiang Lai (left) of PMC;
Right: A group photo of the signing ceremony of the tripartite cooperation agreement.

2020 / 07 / 23

儀科中心引領台灣生醫冠軍隊 2020 亞洲生技大展大放異彩

TIRI leads Taiwan biomedical champion team to yield brilliant results in 2020 BIO Asia-Taiwan

儀科中心攜手成功大學、成大醫院、尖端醫、鐿鈦科技、台微醫、五甫科技、世延生醫、瑞愛生醫以及易訊生技共組台灣生醫冠軍隊，儀科中心提供的雛型品製作、產品試量產之技術加值服務與創新商業模式之輔導能量，以跨界合作模式將醫界需求、學界研發能量與醫材開發商的技術串連在一起，透過「一站式醫材加速器」幫助醫材加值創新，大幅降低醫材產品的研發成本及風險，充分發揮槓桿產業的力道，創造更大的經濟價值。

TIRI formed Taiwan biomedical champion team with NCKU, National Cheng Kung University Hospital, Taiwan Advance Bio-Pharmaceutical (TABP), INTAI, Wiltrom, Wolf Dataware, S&T BIOMED, RedEye Biomedical, and EZsignal Biotech. TIRI provided prototype production, technical value-added service of product trial production, and counseling services of the innovative business model. Through cross-field cooperation, TIRI assisted to link together with the demand of the medical community, the R&D capability of the academic community, and the technology of medical device developers. Through the "one-stop medical device accelerator", the value-added innovation of medical devices is enhanced, the R&D costs and risks of medical devices are greatly reduced, and the strength and leverage of industry are fully exerted, so as to the greater economic value.

2020 亞洲生技大展台灣儀科打造後疫新世代
TIRI pointed the new direction for the post-epidemic era on the 2020 BIO Asia-Taiwan.

2020 / 08 / 18

儀科中心執行科技部感測器服務平台專案　強化智慧機械資訊安全及產業數位轉型

TIRI implements sensor service platform projects of MOST to strengthen information security of intelligent machinery and industrial digital transformation

儀科中心負責籌劃於 2020 台灣機器人與智慧自動化展 (TAIROS) 參與展出的「科技部智慧機械創新館」，集結科技部智慧機械領域五大相關專案共 10 個技術團隊的研發成果。由儀科中心所負責建置的「智慧機械感測器服務平台」及「AQI 氣體感測器服務平台」，協助計畫團隊進行感測器元件製作、封裝與模組化整合測試，藉由儀科中心本身具有的核心技術與產學界媒合能量，減少學界研發成果與產業應用上的技術落差，將這些關鍵技術及感測器元件實際導入到產業應用，促使產業數位轉型。透過跨域整合及法人加值，將這些新創構想及技術與商業模式融合為一生態圈，從感測器元件端到智慧製造應用，形成在地化智慧機械產業聚落並發展策略合作夥伴關係。

TIRI is responsible for planning the "Intelligent Machinery Innovation Pavilion of the Ministry of Science and Technology" exhibited at the 2020 Taiwan Automation Intelligence and Robot Show (TAIROS), gathering R&D achievements of 10 research teams in five related projects. The "Intelligent Machinery Sensors Service Platform" and "AQI Gas Sensor Service Platform" executed by TIRI assisted these teams to integrate the test of sensor component manufacturing, packaging, and modularization. TIRI has outstanding core technologies and strong connection with the industry and academia. With our capability, TIRI effectively shortened the technological gap between academia research and industrial application to introduce the key technologies and sensor components into industrial application, promoting industrial digital transformation. Through interdisciplinary integration and corporate value-added, the novel ideas, technologies, and business models were intermingled into an ecological circle. From sensor components to intelligent manufacturing applications, TIRI and our partners have formed domestic clusters of intelligent machinery industry and have developed strong strategic partnerships.

賴清德副總統及科技部吳政忠部長視察「科技部智慧機械創新館」
Vice President Ching-Te Lai and Minister Tsung-Tsong Wu of MOST inspecting the "Intelligent Machinery Innovation Pavilion of MOST."

2020 / 09 / 08

攜手國內半導體設備商 聯合發表 12 吋叢集式 ALD 設備成果展示
再創台灣自製高階半導體設備里程碑

Joint release of 12-inch cluster ALD equipment exhibit with the Taiwan domestic semiconductor equipment manufacturer
Creating a milestone for Taiwan's self-developed advanced semiconductor equipment

儀科中心與天虹科技股份有限公司於 107 年起合作，整合雙方技術共同開發市場行情新台幣億元的 12 吋量產型叢集式 ALD 設備，並於 108 年完成設備開發及 12 吋氧化鋁薄膜製程驗證，10 奈米厚度的氧化鋁薄膜均勻性 (uniformity) 大於 99%。相較於目前市面上量產型 ALD 設備，本機台擁有降低前驅物消耗量設計與相對高產出速度，並可依客戶端製程與產能需求加掛反應室，具備高度可擴充性；而氧化鋁薄膜製程也率先應用於 Mini-LED 及 Micro-LED 上作為鈍化保護層。天虹科技執行長林俊成博士並於發表會上分享，本機台所發展的製程，改善了 LED 發光效率與使用壽命，效果顯著並獲得驗證。

TIRI and Skytech Inc. have cooperated since 2018 to integrate the technologies of both parties to jointly develop 12-inch mass-produced cluster ALD equipment with a market price of NT$100 million. In 2019, the equipment development and 12-inch alumina film process verification were completed, and the uniformity of alumina film with a thickness of 10 nanometers was more than 99%. Compared with the mass production of ALD equipment currently on the market, this equipment requires less precursor consumption and gives relatively higher production throughout. Furthermore, it can be equipped with a reaction chamber upon request from clients' requirements of process and capacity with high scalability. The alumina thin film process is also the first to be applied to Mini-LED and Micro-LED as a passivation protective layer. Dr. Chun-Cheng Lin, CEO of Skytech Inc., shared at the press conference that the luminous efficiency and service life of LEDs has been improved remarkably with the process of the equipment.

國研院儀科中心與天虹科技舉辦「12 吋叢集式原子層沉積先進設備發表會」，國研院吳光鐘院長（圖中）到場見證台灣自製高階半導體設備里程碑。
TIRI of NARLabs and Skytech Inc. held the "12-inch Cluster ALD Advanced Equipment Launch & ALE/ALD Conference", and Dean Kuang-Chong Wu of NARLabs (middle in the picture) was present to witness the milestone for Taiwan's self-developed advanced semiconductor equipment.

2020 / 09 / 24

2020 台灣國際半導體展 儀科中心展現自研自製成果

TIRI shows self-development and self-production achievements at SEMICON Taiwan 2020

儀科中心以驅動儀器設備在地化為使命，近年來全力投入半導體高階儀器設備及關鍵零組件之自研自製，展示多樣態曝光機客製化光學元件展品，落實半導體設備光學元件自主化製造目標，更展出國內第一部自製先進原子層磊晶蝕刻 (Atomic Layer Etching, ALE) 設備，並經由國研院半導體中心之製程平台製作出 E-mode 氮化鎵 (GaN) 元件，成功驗證各項電性測試，同步於技術論壇發表「國研院先進半導體設備與製程技術」在地化相關研發成果。

With the mission to drive the domestic capability of instruments, TIRI has strived to develop and produce advanced semiconductor instruments as well as key parts and components in recent years. TIRI also demonstrated the diverse customized optical components of lithography stepper, and implemented the objective to independently manufacture the optical components of semiconductor devices. In addition, Taiwan's first self-developed advanced atomic layer etching (ALE) equipment was exhibited at SEMICON Taiwan 2020. E-mode gallium nitride (GaN) components were fabricated through the process platform of Taiwan Semiconductor Research Institute of NARLabs, successfully verifying various electrical tests. Relevant R&D results were simultaneously published at the technical forum of Seminar of NARLabs' Advanced Semiconductor Equipment & Process Technology (NARLabs 2020 ASEPT Seminar).

左圖：於「2020 台灣國際半導體展」展示通過半導體製程實際驗證之曝光機關鍵零組件，以及半導體產業高階儀器設備自主研發成果與客製服務績效；下圖：「國研院先進半導體設備與製程技術」技術論壇。

Left: At "SEMICON Taiwan 2020", TIRI demonstrated the critical parts and components of lithography stepper and the self-developed research achievements of advanced instruments in the semiconductor industry and the performance of customized services;

Below:The technical forum of "NARLabs 2020 ASEPT Seminar".

2020 / 10 / 17

第十二屆「國研盃 *i*-ONE 儀器科技創新獎」 推動跨領域儀器創新人才培育

The 12th "*i*-ONE NARLabs Instrument Technology Innovation Competition" fosters the cultivation of interdisciplinary instrument innovation talents

「國研盃 *i*-ONE 儀器科技創新獎」創設迄今已逾十載，培育科研人才不遺餘力，歷年來共計 300 組優秀作品報名參賽，儀科中心將與企業夥伴持續提供儀器創新實作平台，鼓勵同學們透過一次又一次的發想及討論，將理論落實於實作，培養動手操作、實現創意的能力與經驗，讓這些新世代的創客能啟動我國創新風潮，發展具有全球競爭力的科技技術。

"*i*-ONE NARLabs Instrument Technology Innovation Competition" has been founded for more than a decade and has devoted to training scientific talents. Over the years, 300 pieces of outstanding works in total have signed up for the competition. TIRI and its business partners will continue to provide a platform for instrument innovation and implementation, encourage students to put theory into practice through repeated thinking and discussion, and cultivate their ability and experience of hands-on operation and creativity. *i*-ONE aims to stimulate the new-generation makers to start the innovation trend in Taiwan and develop global competitiveness.

「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 12 屆。
"*i*-ONE NARLabs Instrument Technology Innovation Competition" has devoted to the cultivation of in-house instrument talents for 12 years

2020 / 11 / 05

儀科中心輔導成功大學研究團隊開發「牙周病即時靈敏檢測平台」勇奪科技部法人鏈結產學合作成果雙料獎牌

TIRI counsels the NCKU research team to develop "Real-Time Sensitivity Testing Platform for Periodontal Disease" This achievement wins double medals at Industry-Academia Catalyst E-Platform (I-ACE) Show held by MOST

儀科中心輔導成功大學團隊開發「牙周病即時靈敏檢測平台」，利用配體指數增強系統進化技術篩出專一性辨識牙周致病菌種之適體，並結合已成熟發展之高靈敏放大試劑，透過儀科中心法人加值服務，並且串連與尖端醫技轉合作，達到法人鏈結真正的意義，同時儀科中心並獲頒人氣獎第二名榮耀。

TIRI guided "Real-Time Sensitivity Testing Platform for Periodontal Disease" developed by National Cheng Kung University (NCKU), using ligand index enhanced systematic evolution technology to screen out aptamers that specifically identify periodontal pathogenic bacteria. This technology combined with mature and developed high sensitivity amplification reagents, which TIRI provided a value-added service and introduced for technology transfer to Taiwan Advance Bio-Pharmaceutical Inc. (TABP), realizing the true meaning of industry-academia catalyst. At the same time, TIRI was awarded the second honor of popularity award.

儀科中心輔導團隊獲頒科技部法人鏈結產學合作成果雙料獎牌
TIRI's counseling team was awarded double medals of MOST I-ACE Show.

2020 / 12 / 01

儀科中心與臺大合作 共同榮獲「17 屆國家新創獎－臨床新創獎」
TIRI and NTU jointly win the "17th National Innovation Award-Clinical Innovation Award"

儀科中心與臺灣大學陳益祥醫師團隊共同研發「可攜式 LED 照明攝影同軸手術頭燈暨智慧化影像剪輯系統」，創新系統設計頭燈光源與光學成像鏡組同軸，解決長久以來外科醫師觀察視野與光照區域之影像無法一致的問題，獲頒第 17 屆國家新創獎－臨床新創獎。

TIRI and NTU research team led by Dr. Yih-Shurng Chen jointly developed a "Portal LED coaxial lighting and video recording system with intelligent editing function" and innovated the system design. The headlight source was coaxial with the optical imaging lens group, which solved the problem that the surgeon's observation field of vision and the image of the illumination area are unable to be consistent for a long time. They were awarded Clinical Innovation Award in the 17th National Innovation Award.

與台大團隊共同研製同軸手術頭燈，榮獲第 17 屆國家新創獎－臨床新創獎。
Jointly developing coaxial surgical headlights with the NTU team and winning the 17th National Innovation Award-Clinical Innovation Award

2020 / 12 / 04

輔導研發全國首創牙周病 6 分鐘檢測利器 成功鏈結成大與尖端醫簽署 880 萬技轉合約

Counseling the R&D of Taiwan's first 6-minute detection tool for periodontal disease and successful bridging NCKU and TABP to sign an NT$ 8.8 million technology transfer contract

透過儀科中心法人加值服務，輔導成功大學團隊製作出牙周致病菌快篩試片，並鏈結台灣尖端先進生技醫藥股份有限公司合作開發出全國首創的「牙周致病菌快篩套件」，該快篩套件可以讓受測者在過程中，不會感到不適且於診間內 6 分鐘內就可以快速完成檢查。由於檢測效果良好，成功媒合尖端醫與成功大學簽下 880 萬元技轉合約。

Through TIRI's medical device value-added service, the research team of National Cheng Kung University (NCKU) was guided to develop quick screening test pieces for periodontal pathogens. TIRI bridged NCKU and Taiwan Advance Bio-Pharmaceutical Incorporation (TABP) jointly to develop the first "Quick Screening Kit for Periodontal Pathogens" in Taiwan, which can make the subjects quickly complete the examination within 6 minutes at a clinic without feeling uncomfortable. Due to the good detection effect, TIRI successfully promoted TABP and NCKU to sign a technology transfer contract of NT$ 8.8 million.

儀科中心輔導成大團隊，合作開發全國首創的「牙周致病菌快篩套件」。
TIRI counseled the NCKU team and cooperated in developing the first "Quick Screening Kit for Periodontal Pathogens."

109 年獲獎記錄 Awards in 2020

活動 Event	參賽作品 Participating Work	獲獎項目 Award
109 年光電學會光電科技貢獻獎 2020 Photonics Science and Technology Contribution Award of Taiwan Photonics Society	太陽能板產線智慧即時回饋檢測設備 Smart inspection equipment with real-time feedback for solar panel production line	光電科技貢獻獎 Photonics Science and Technology Contribution Award
科技部 109 年法人鏈結產學合作成果發表會 2020 Industry-Academia Catalyst E-Platform (I-ACE) Show of MOST	牙周病即時靈敏檢測平台 Real-time sensitivity testing platform for periodontal disease	輔導績優案源第三名 及最佳人氣第二名 The third prize for guide of outstanding case award and the second prize of popularity award
第 17 屆國家新創獎 17th National Innovation Award	可攜式 LED 照明攝影同軸手術頭燈暨智慧化影像剪輯系統 Portal LED coaxial lighting and video recording system with intelligent editing function	臨床新創獎 (與台大陳益祥醫師團隊共同榮獲) Clinical Innovation Award (award winning with NTU team led by Dr. Yih-Shurng Chen)
天使投資 Angel investment	精準性檢驗類風濕性關節炎之診斷套組 Diagnostic kit of rheumatoid arthritis for accuracy test	儀科輔導之團隊榮獲競賽優等 Counseled team by TIRI was awarded Excellence Award
SmartLabs 成果競賽 SmartLabs Achievement Competition	新台北奈米生醫科技 - 齒槽骨再生材料 New Taipei Nanobiomedical Technology-Alveolar bone regeneration material	儀科輔導之團隊榮獲首獎 Counseled team by TIRI was awarded First Prize

Taiwan Instrument Research Institute

儀器科技發展

Development of Instrument Technology

支援前瞻學術研究
Supporting Forward-looking Academic Research

儀科中心積極建構跨領域整合的儀器科技研發服務平台，是國內唯一可提供學術界客製化開發特殊關鍵模組與儀器設備的單位，滿足各領域進行前瞻研究與實驗的特殊需求，期能促進科學上的新發現。

TIRI actively constructs an interdisciplinary R&D service platform for instrument technology. It is the only research institute in Taiwan that can provide customized development of key modules, and instruments to meet the special needs of forward-looking research and experiments in various fields and to facilitate new scientific discoveries.

客製化 PE-ALD 系統 | Customize PE-ALD System

聯手學研單位，深化研究能力與強化合作關係
Cooperating with academia to deepen research capabilities and strengthen relationships

因應下世代複雜之先進製程發展，提供中山大學客製化 4 吋 PE-ALD 系統，採用 remote CCP plasma，其薄膜均勻性與製程穩定性極佳，提升學研界半導體製程技術研究能量。

In response to the next generation of complex and advanced process, the 4-inch PE-ALD equipment was customized for National Sun Yat-sen University. It uses remote CCP plasma featuring excellent film uniformity and process stability to improve the research of semiconductor process technology capability.

系統規格 System specifications :

- 基板尺寸 Substrate size：1 — 8 inches
- 基板溫度 Substrate temperature up to 400 ℃
- 電漿 Plasma：RF, up to 600 W

複合式原子層蝕刻 / 沉積系統 | Hybrid ALE/ALD System

適用學研客製化蝕刻 / 磊晶製程實驗裝置
Customized atomic etching/layer deposition system

小型落地化原子層鍍膜系統 及原子層蝕刻系統結合，專為小尺寸試片與探針製鍍超薄奈米結構，具備高密度表面絕緣高品質保護膜製鍍，並可應用於生物試片與原子解析度三維重構試片製鍍，幫助學研節省研發期間前驅物材料的浪費。

The combination of atomic etching/layer deposition system was designed for nano-structures coating process on small-size coupon and probes especially for biological and atomic three-dimensional specimens for scientific research to save the waste of precursor materials.

系統規格 System specifications :

- 製程反應腔全周採用氧化鋁保護製程穩定
  The alumina reaction chamber keeps the process stable.
- 4 吋晶片載座操作溫度 350 － 400 ℃
  The operating temperature of the 4-inch chip carrier is 350-400 ℃
- 感應耦合電漿 300 W
  Inductively Coupled Plasma (ICP) 300 W
- MFC 流量控制模組
  MFC flow control module
- 模組式儀控箱，輕鬆升級與檢修
  Modular control box with easy upgrade ability and maintenance

鼠腦檢測之大口徑高解析光學顯微系統物鏡 |
The Objective Lens of the Large Aperture and High Resolution Optical Microscopy System

揭開大腦神秘面紗
For rat brain detections to unveil the mystery of the brain.

為中央研究院腦科學團隊量身客製之顯微物鏡，具備大範圍成像視野 (直徑 22 mm) 與高空間解析度 (1 μm) 的特性，拍攝一次即可取得一層完整鼠腦範圍的高解析影像，改善一般顯微物鏡成像範圍過於狹窄及影像拼接的問題，大幅提高取像與研究的效能。可應用於高解析 3D 影像建構，有助於研究團隊未來進一步探索老鼠腦，揭密與蛋白質分布有關之機制，對解答部分人類腦部疾病做出貢獻。

The large aperture microscopic objective was developed for the Academia Sinica Team. It has the characteristics of a large view field (22 mm in diameter) and high spatial resolution (1 μm). It can solve the problems of narrow image filed and image mosaic of general microscopic objective lenses and greatly raises the efficiency of image acquisition. It can be applied to the construction of high-resolution 3D images, which will help the research team to further explore the mouse brain in the future, reveal the mechanism related to protein distribution, and contribute to solving some human brain diseases.

系統規格 System specifications :

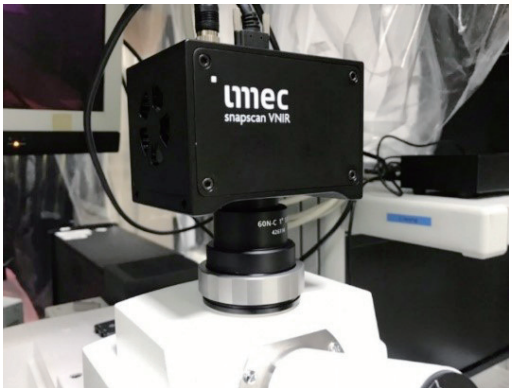
- 無限遠共軛設計 Infinity correction
- 油浸 / 水浸式設計 Oil / Water immersion
- 適用波長 Applicable wavelength：可見光 Visible light
- 數值孔徑 Numerical aperture (NA)：0.3
- 成像圈 Image circle：Φ22 mm
- 工作距離 Working distance ＞ 30 mm

內置推掃式高光譜顯微鏡技術開發與應用 |
Snapscan Microscopic Hyperspectral Imaging System and Its Application

與比利時微電子研究中心 (imec) 合作
Cooperating with imec, Belgium

儀科中心團隊將與 imec 及陽明交通大學三方合作，開發內置推掃式高光譜顯微鏡技術開發與應用，本系統包含多波長影像及寬頻光譜資訊，以及高光譜影像技術之應用領域廣泛多元，未來將應用於奈微米材料與生物組織的顯微鏡影像分析。

TIRI, imec, and NYCU jointly developed the snapscan microscopic hyperspectral imaging system. The system includes multi-wavelength images and broadband spectral information, as well as a wide range applications of hyperspectral imaging technology. It will be applied to microscopic image analysis of nano-micro materials and biological tissues in the future.



系統規格 System specifications :

- 波長範圍 Wavelength range：470 nm — 900 nm
- 光譜為 Spectrum：150 bands
- 影像像素 Image pixels of 10 bits

促進重點產業發展
Promoting the Development of Key Industries

儀科中心長期因應國家政策擴展研發能量，推動高階關鍵儀器設備及元組件之自主研發與應用，配合政府六大核心戰略產業發展重點，以加速我國產業升級轉型，讓臺灣成為未來全球經濟的關鍵力量。

TIRI has been expanding its research and development capability in response to national policies for a long time, boosting research, development and applications of high-end key instruments and components. In line with government's "six core strategic industries" development priorities, TIRI targets to accelerate Taiwan's industrial upgrading and transformation, making Taiwan a key force in the future global economy.

太陽能板產線智慧即時回饋檢測設備 |
Smart Inspection Equipment with Real-time Feedback for Solar Panel Production Line

智慧機械加值綠能產業，跨域整合創新利
Smart machinery adds value to the green energy industry to create more benefit

儀科中心攜手全台第一傳動大廠上銀科技股份有限公司，以及上銀光電股份有限公司客製開發 CIGS 線上板材全檢設備，在 1 分鐘內即可完成一片板材檢測，不但檢測效能提升 30 倍以上，並可即時分析研判結果，據以對製程進行調整，大幅提升生產效能和品質。

TIRI joined hands with HiWin Technologies, the leading brand of motion control and system manufacturer in Taiwan, as well as with Eterbright Solar to customize online inspection equipment for solar panels. One panel

inspection can be completed within one minute. The equipment not only improves the inspection efficiency by more than 30 times, but also analyzes the data in real time. In this way, it adjusts the manufacturing process and greatly improves production efficiency and quality.

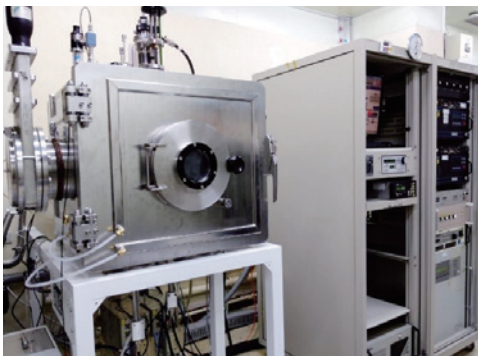
系統規格 System specifications :

- 量測與檢測板材尺寸 Panel size：1220 mm × 620 mm
- 影像空間解析度 Spatial resolution：5 μm/pixel
- 取像效能 Imaging efficiency ＜ 20 second/panel
- 檢測效能 Detection efficiency ＜ 30 second/panel
- 板材檢測項目 Detection items for solar panels：
  (1) 鍍膜帶寬
  Width for each coating stripe
  (2) 切割線之線寬、直線度、間距及邊緣崩缺
  Line width, straightness, interval and chipping for each cutting line
  (3) 鍍膜區之污染微粒與鍍膜脫落
  Particles and stripped coating

智能電控系統 | Smart Electronic Control System

智能電控導入濺鍍設備，打造智慧機聯網
Smart electronic control is imported into sputtering equipment to build smart machine networking

儀科中心所建置的濺鍍設備具備全數位化系統架構，可自動化排程控制與操作及事件紀錄等功能，由儀科中心自行開發之數位化濺鍍製程控制軟體，系統設備可藉由圖形使用介面 (GUI) 進行製程參數的設定及系統參數監控，以及可以自動化方式完成多層膜的製鍍 (經初步驗證，可達 75 層以上)，不須人工現場操作與監視，可發展為 AI 功能導入智能真空鍍膜設備。



Sputtering equipment has a fully digital system with automatic scheduling control and operations, event recording, and other functions. The digital sputtering process control software developed by TIRI can set and monitor process parameters using the graphic user interface (GUI). It can also automatically complete multi-layer film coatings (up to more than 75 layers after preliminary verification) without any manual operations or monitoring. This software can gradually develop AI function and be imported into smart sputtering equipment.

系統規格 System specifications :

- 全數位化的電控系統
  Fully digital electronic control system
- 圖形使用介面 (GUI) 進行製程參數的設定及系統參數監控
  The graphic user interface (GUI) is used.
- 可以自動化方式完成多層膜的製鍍
  Automatic coating of multilayer thin films

12 吋叢集式 ALD 設備 | 12-inch Cluster ALD Equipment

攜手國內設備廠，再創台灣自製高階半導體設備里程碑

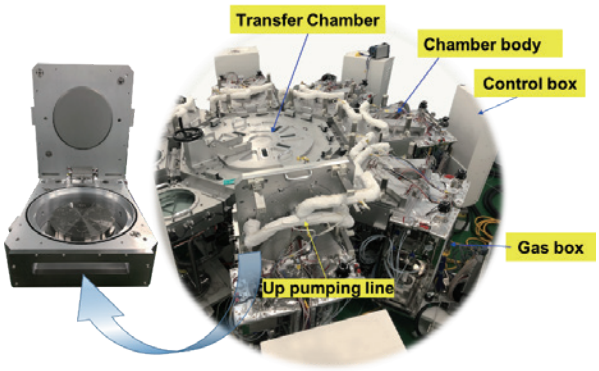
Joining hands with the domestic equipment manufacturer to create the new milestone for Taiwan's self-developed advanced semiconductor equipment

儀科中心與天虹科技整合雙方技術共同開發市場行情新台幣億元的 12 吋量產型叢集式 ALD 設備，本機台擁有降低前驅物消耗量設計與相對高產出速度，並可依客戶端製程與產能需求加掛反應室，具備高度可擴充性；而氧化鋁薄膜製程也率先應用於 Mini-LED 及 Micro-LED 上作為鈍化保護層，改善了 LED 發光效率與使用壽命。

TIRI and Skyt Tech Inc. integrated the technologies of both parties to jointly develop 12-inch mass production cluster ALD equipment with a market price of NT$100 million. The machine requires less precursor consumption and gives relatively higher production throughput. Moreover, it can be equipped with a reaction chamber upon request from clients to meet their process and capacity requirements with high scalability. The alumina thin film process is also the first to be applied to Mini-LED and Micro-LED as a passivation protective layer, which improves the luminous efficiency and service life of LED.

系統規格 System specifications :

- 叢集式設計，最多可銜接 6 台 ALD 模組
  Cluster design, up to 6 ALD modules can be connected
- 基板尺寸 Substrate size：12 inches
- 基板溫度 Substrate temperature up to 450 ℃
- 低腔體容積設計，可節省前驅物消耗與提高鍍膜效率
  The design of low cavity volume can save the consumption of precursors and improve the coating efficiency.
- Al_2O_3 non-uniformity ＜ 1%.



深化社會影響力
Deepening Social Influence

為有效擴散技術貢獻於社會，儀科中心致力針對社會民生需求，投入醫療、智慧節能、智慧農業與災害防救應用等提供多樣化的儀器系統創新開發。

To effectively diffuse technology and contribute to society, TIRI is committed to providing diversified instruments innovation and development for the needs of people's livelihoods, including medical treatment, intelligent energy conservation, intelligent agriculture, disaster prevention and rescue applications.

智慧節能方案 | Intelligent Energy-saving Solutions for Factories

大數據及 AI 智能導入空調系統，實現工廠節能智慧化

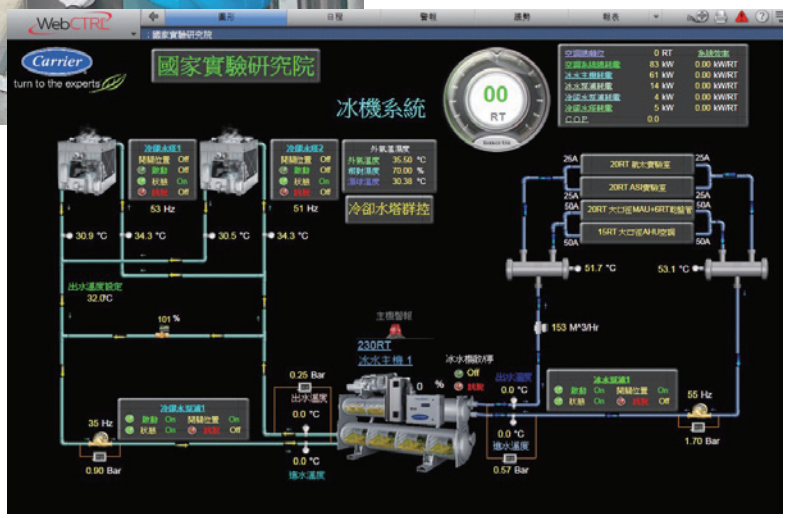
Incorporating big data & AI for air conditioning system for intelligent energy saving

儀科中心與輝瑞大藥廠合作，進行全方位之能源監測、分析、管理及最佳化節能控制。系統除可支援各式感測器及電錶外，更提供內建之分析模型及智慧演算法，藉由設定點之即時優化調整、動態效率預測管理及生產效能分析，可大幅提升主要能耗設備之運維效率，提高節能成效，達成用能設備「自主優化」運轉讓能源使用效率提升 3 — 15%。

TIRI cooperated with Pfizer, Inc. to conduct all-around analysis, management, and optimization of energy conservation control. It provides built-in analysis models and intelligent algorithms for various parameters of sensors and meters. Through real-time optimization and adjustment of set points, dynamic operation efficiency prediction, and production efficiency analysis, the operations and maintenance of the major energy-consuming equipment can be greatly improved, and the energy-saving effect can be enhanced. The goal of "independent optimization" operation of energy-consuming equipment can be achieved, which can increase energy efficiency by 3%-15%.

系統特色 Features :

- 透過資料探勘、K-means 分群方法與 Gap statistic 方法，對冰水主機資料進行預處理。
  Data mining, K-means clustering method, and Gap statistic method can be adopted to pre-process the chiller system data.
- 利用分群結果結合機器學習模型，有效提升模型之預測精準度，增加能源基線的可靠性。
  The clustering results are combined with the machine learning model to effectively improve its prediction accuracy and increase the reliability of the energy baseline.
- 系統為一結合物聯網技術、大數據探勘、最佳化建模與尋優技術及可靠度模式等之仿人工智慧專家系統，透過數據分析以改善傳統耗能設備之運作缺點。
  The system is an artificial intelligence expert system that combines Internet of Things technology, big data exploration, optimized modeling, optimization technology, reliability model, etc. Through data analysis, the system is able to efficiently improve the operation efficiency of energy-consuming equipment.



農業用高光譜儀 | Hyperspectrometer for Agriculture Application

支援環境自動化檢測
Supporting for automatic detections of environments

儀科中心與陽明交通大學合作智農計畫，主要工作為開發經濟型農業用高光譜儀及空拍實驗，持續致力於智慧科技於農業生產之應用研究，以協助農業科技邁向智慧農機的新世代，解決農事人力不足及有效益農業管理。

TIRI cooperated with NYCU in the Intelligent Agriculture Project and worked on developing a UAV hyperspectrometer. TIRI continues to devote itself to the application research of smart technology in agricultural production, so as to help agricultural technology move towards a new generation of intelligent agricultural machinery and solve the shortage of agricultural manpower and effective agricultural management.

系統規格 System specifications :

- 光譜範圍 Spectral range：430 — 950 nm
- 光譜解析度 Spectral resolution：3 — 5 nm
- 總重量 (含電池) Total weight (including battery)：650 grams
- 視角 Field of View：50 ° (鏡頭可更換) (Lens can be replaced.)
- 成本低，適合農用，國產自製維護容易
  Low cost, suitable for agricultural use, and easy maintenance

微生物抑制溫控與光照系統 |
Temperature Control and Illumination System for Microbial Inhibition

完善國內健康照護平台
Developing and improving the health care platform in Taiwan

微生物抑制系統中光照燈源為 UVC LED，透過相對應之旋鈕調控腔體內溫度與各 UVC LED 之亮度，其智慧溫控恆溫系統會自行偵測腔體內溫度並自動補償以達恆溫之效果。同時具有光照式與加熱式兩大消毒功能，可廣泛應用於醫療設備及居家小型元件或樣品消毒。

The UVC LEDs are used in the microbial inhibition system and the temperature in the cavity and the brightness of each UVC LED are controlled through the corresponding knob. The intelligent temperature control module can automatically detect the temperature in the cavity and compensate to achieve the effect of constant temperature. It has two disinfection functions of illumination type and heating type and can be widely used in the disinfection of small medical devices or components at home.

系統規格 System specifications :

- 紫外光源波長 Wavelength of ultraviolet light source：254 nm、265 nm、280 nm
- 持續光照時間為 Duration of illumination：0 — 300 s
- 加熱範圍 Heating range：50 — 90℃

Taiwan Instrument Research Institute

任務導向研發

Mission-oriented Research & Development

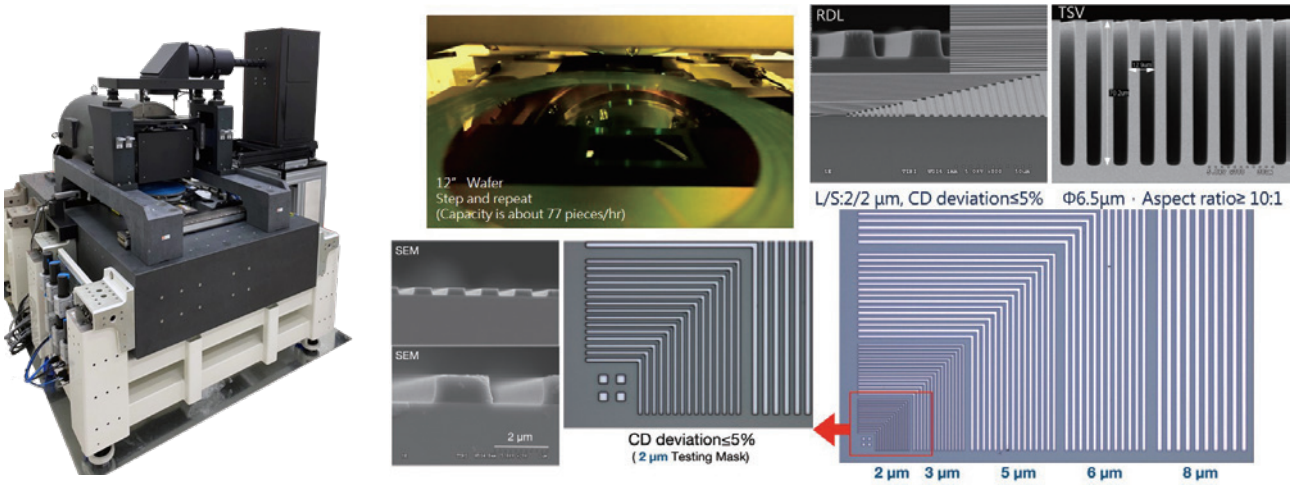
推動前瞻基礎建設—「自研自製高階儀器設備與服務平台」計畫

Striving for Forward-Looking Fundamental Construction - "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。主要建立我國半導體製程高階封裝儀器設備自製能力，逐步協助國內半導體設備產業進入高附加價值之半導體製程設備供應鏈，使國內廠商能佈局半導體製程設備產業，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，並提供國內自研自製半導體設備進廠前的機台測試與規格驗證。

109 年主要成果如下：

- 完成曝光機系統相容於 8 吋與 12 吋晶圓，試曝驗證解析度可達重布線層 (Redistribution Layer, RDL) 線寬 / 線距 (L/S) ≦ 2 μm /2 μm、矽穿孔 (Through Silicon Via, TSV) 直徑 10 μm (深寬比 10:1)，產能預估每小時 77 片，規格符合儀器產業需求，並可應用於晶圓層級先進封裝產業 (3D-IC) 如 5G 通訊、生物晶片、車用電子與智慧感測器等。
- 成功利用自製 Thermal ALE 設備，並進行 RIE/Thermal ALE 製程技術開發，達成 GAA 架構之製程驗證目標。



自研自製國內首部步進式曝光機，經製程驗證線寬 / 線距達 2 μm / 2 μm 及 TSV 深寬比達 10:1。
The first self-developed lithography stepper in Taiwan; its line/space reaches 2 μm/2 μm and the aspect ratio of TSV reaches 10:1 through the process verification.

TIRI has accumulated abundant experience in the R&D of photonics instruments, and the integration of optomechanical systems. It has also participated in the integrated project of the"Advanced Research Instrumentation Development Service Platform" in the "Forward-Looking Fundamental Construction". This project primarily aims to domestically develop high-end packaging equipment for semiconductor process technology in Taiwan, gradually assisting domestic companies to expand into the supply chain of semiconductor process equipment, in order that Taiwanese manufacturers can deploy and level up the industry. Also, TIRI hopes to help Taiwan's manufacturers configure and integrate the upstream, midstream, and downstream technologies of semiconductor equipment industry in Taiwan. Furthermore, it strives to upgrade Taiwan's semiconductor equipment capability, and provide equipment testing and verification to Taiwan's self-developed semiconductor equipment before entering the factory.

The main achievements in 2020 are as follows:

- The lithography stepper is compatible with 8-inch and 12-inch wafers, and the resolution can reach redistribution layer (RDL) Line/Space (L/S) ≦ 2 μm/2 μm and the diameter of the through silicon via (TSV) is 10 μm (aspect ratio of 10:1). The production capacity is estimated to be 77 pieces/hr. The specifications satisfy the requirements of the instrument industry and can be applied to wafer-level advanced packaging industries (3D-IC) such as for 5G communications, biochips, automotive electronics, and intelligent sensors.
- TIRI developed RIE/Thermal ALE process technology by using self-developed thermal ALE equipment and achieved the specification of the GAA structure.

辦理「國研院先進半導體設備與製程技術」技術論壇，展示「自研自製高階儀器設備與服務平台」計畫成果。
The achievements of the "Advanced Research Instrumentation Development Service Platform" project were published in the technical forum of "NARLabs 2020 ASEPT Seminar".

推動創價醫材加速器平台計畫

Boosting Medical Device Accelerator for Value Creation Project

儀科中心運用自身生醫科技核心實驗室研發能量與檢測驗證能力，提供研發團隊醫療器材開發輔導與檢測驗證一站式服務。藉由創價醫材加速器平台，加速研發團隊研究成果之轉譯與加值，並橫向連結北、中、南三大科學園區與工業局，加速新創及協助既有生醫廠商升級茁壯，提升生醫產業國際競爭力。

109 年主要成果如下：

- 109 年本平台已輔導 2 廠商取得國際認證，包括興能高科技股份有限公司醫療用鋰電池取得 ISO 13485 國際認證、普瑞博生技股份有限公司血液減除白血球過濾器通過歐盟 CE 認證，有效促成新創公司產品與國際市場接軌。另協助 3 團隊分別通過人體試驗審查委員會申請，進行人體試驗，加速研發成果進入臨床應用。
- 發揮創價醫材加速器平台跨領域整合能量，推動臨床需求轉譯產品化，從成大醫院醫生提出之幹細胞治療關節炎的臨床需求確認出發，技術整合成大 / 高孔洞高分子與生物水膠的軟骨修復材料研究、尖端醫 / 脂肪幹細胞治療平台、五甫科技 /AI 運算技術、台微醫 / 關節鏡手術植入器械與儀科中心 /IVD 產品測試與驗證能量，架構出全球首例的智慧化關節炎分型與精準細胞治療產品，促成 3 廠商於南科園區落地生根，加速南科精準健康產業聚落成形。
- 參與法人鏈結計畫，架構學界研發成果擴散平台，協助成功大學吳炳慶副教授團隊「牙周病菌即時靈敏檢測平台」案源技術移轉予台灣尖端先進生技醫藥 (股) 公司，金額達 880 萬元，加速學研成果商化轉譯，並榮獲科技部績優案源獎第三名。
- 配合政府新南向政策鏈結東南亞國家，延續與泰國國家發展局 (NSTDA) 下 BIOTEC-IBST 實驗室合作，進行「肺癌檢測技術開發」計畫，深化國際夥伴合作關係。並整合國內臨床前優質動物實驗能量，成功爭取新加坡國立大學 2 國際標案，已協助國際團隊完成 3D 列印客製化牙植體之功能與安全性驗證，展現扶植生醫新創之優質研發服務能量。

儀科中心輔導成功大學研究團隊開發「牙周病致病菌快篩套件」，並成功技轉予台灣尖端先進生技醫藥 (股) 公司，技轉金額達 880 萬元。

TIRI counseled the research team of National Cheng Kung University to develop the "Rapid Test Kit for Periodontal Disease" and successfully transferred the technology to Taiwan Advance Bio-Pharmaceutical Inc. with an amount of NT$8.8 million.

Given its own R&D advantages of biomedical core facilities, as well as testing and verification capabilities, TIRI provides a one-stop service for medical device R&D teams from prototype counseling to product testing and verification. Based on the medical device accelerator platform, TIRI assisted the medical device R&D teams to accelerate the commercialization of their R&D results. It has also horizontally connected Taiwan's three Science Parks with the Industrial Development Bureau, MOEA to speed up innovations, assisted in the upgrade and growth of existing biomedical manufacturers, and enhanced the international competitiveness of the biomedical industry.

The main achievements in 2020 are as follows:

- Coached 2 manufacturers to get international certifications, one is SYNergy ScienTech Corp. to get ISO 13485 certification for its lithium-ion battery for active medical device use, the other one is Puriblood Medical Co., Ltd. to get CE certification for its sterile leukocyte reduction filter set. The platform has effectively assisted startups to access the international market. In addition, it has assisted three research teams to go through the Institutional Review Board (IRB) process, so as to accelerate the translation of R&D results into clinical application.
- Levered the interdisciplinary integration capabilities of the "Medical Device Accelerator Platform" to promote the commercialization of the research. Starting from the confirmation of the unmet needs of stem cell therapy for arthritis proposed by doctors from the National Cheng Kung University Hospital, TIRI assisted to integrate 5 institutions' technologies, including NCKU/cartilage repair materials of high pore polymer and biological water gel, TABP/adipose-derived stem cell therapy platform, Wolf Dataware/ AI computing technology, Wiltrom Medical/arthroscopic surgery implantation equipment, and TIRI/IVD product test and verification capability. By constructing the world's first intelligent arthritis typing and precision cell therapy product, it has enabled three manufacturers to take root in Southern Taiwan Science Park and accelerated the formation of precision health industry settlement.
- Participated in the Academia-Industry Collaboration by Research Institutes Project and formed the diffusion platform of R&D results, assisted Associate Professor Ping-Ching Wu's team at National Cheng Kung University to successfully transfer the technology of "Rapid Test Kit for Periodontal Disease" to Taiwan Advance Bio-Pharmaceutical Inc. (TABP), with an amount of NT$8.8 million, accelerated the commercialization of academic research achievements, and won the third place in the Ministry of Science and Technology Award for Excellent Case Source.
- Cooperated with the government's new southward policy to link Southeast Asian countries, continued to cooperate with BIOTEC-IBST laboratory under the National Science and Technology Development Agency (NSTDA), carried out the Lung Cancer Detection Technology Development program, and deepened international partnerships. Moreover, TIRI integrated pre-clinical high-quality animal experimental capability in Taiwan, successfully won the National University of Singapore international bid, assisted the international team to complete the function and safety verification of 3D printing customized dental implants, and demonstrated the expert capabilities to provide high-quality R&D services to foster the biomedical startups.

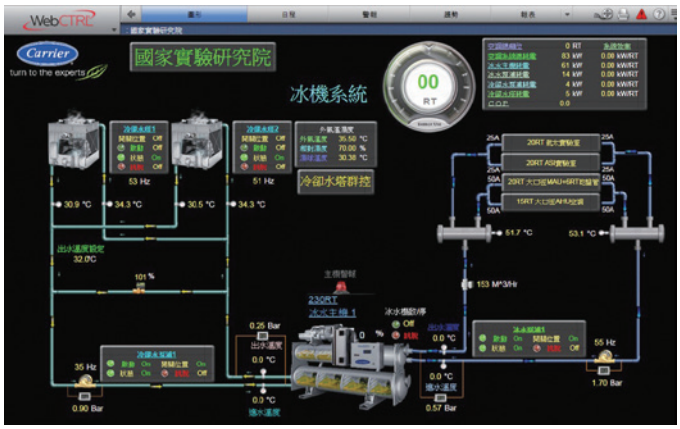
推動智慧製造關鍵技術發展與應用計畫

Pressing ahead for the Intelligent Manufacturing Technology Projects

本計畫結合學研界合作開發智慧機械感測器與智能化技術，以國研院既有實驗設施做為生產製造場域，導入智慧製造聯網與資料蒐集技術，串聯異質資訊系統，整合精密光學製造人員、物料、環境與製程之製造履歷及數據，提供數位製造與設計和高值化先進製造整合為主，以跨領域高質化與高值化智能製造技術為重點目標，整合跨領域資源，以支援高品質與高附加價值之智慧機械產業發展。

109 年主要成果如下：

- 國研院推動智慧機械感測器專案落實感測器在地化發展，舉辦「鏟花工藝傳承 · 感測器扮演要角」與中山大學及精機中心三方合作協議簽署儀式，本中心與半導體中心負責執行「智慧機械感測器服務平台」專案計畫，協助學研團隊研發具量產潛能的感測元件與模組，將研發中的感測器導入終端產業場域進行檢校與實測，以縮短學研與產業應用落差，共同開創台灣感測器研發聚落，落實感測器自主化與場域測試應用發展契機。
- 儀科中心與精機中心合作，發展粉塵感測器 (0.3, 0.5, 1.0, 2.0 μm) 應用於工具機實際切削狀態下切削粉塵資訊。將感測器原始數據蒐集與轉換進行資料擷取，建立粉塵數據量、刀具破壞情況間大數據資料將提供後續 AI 智能分析之依據，提升工具機使用效率及加工品良率。
- 完成智慧工廠 - 環境暨能源之智能化監控系統，針對廠務環控等設備進行全方位之能源監測、分析、管理及最佳化節能控制。系統除可支援各式感測器及電錶外，更提供內建之分析模型及智慧演算法，藉由操作設定點之即時優化調整、動態效率預測管理及生產效能分析，可大幅提升主要能耗設備之運維效率，提高節能成效，實現環境品質、舒適及節能三贏之能源管理目標。該系統將可在不更動任何既有組成設備及不影響供給品質條件下，以其優化邏輯及演算法來求取並決定各機組設備的最適運行模式，進而達成「經濟運轉 (調控)」目標，有效提升能源使用效率 3 — 15 %。

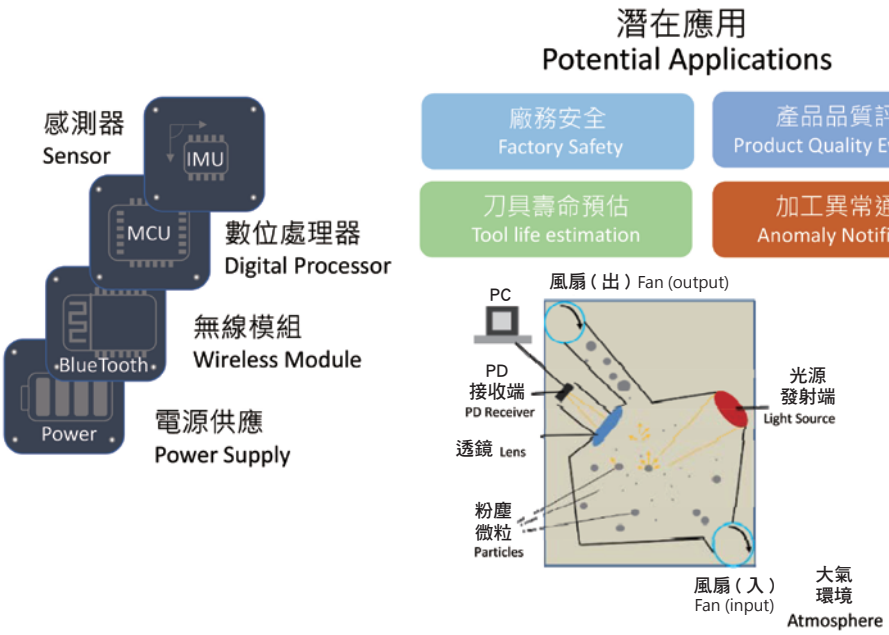


智慧工廠 - 環境暨能源之智能化監控系統
Intelligent factory monitoring system for environment and energy

This program has developed intelligent mechanical sensors and technologies through the cooperation with academic and research communities. The experimental facilities built by NARLabs are used as the manufacturing field, not only intelligent manufacturing networking but data collection technologies are introduced. In addition, heterogeneous information system of the manufacturing history, data of personnel, materials, environment, and processes in precision optical manufacturing are connected and integrated, which aims to combine digital manufacturing and design with high-value advanced manufacturing. This program has integrated cross-domain resources to support the development of high-quality and high-value-added smart machinery industries.

The main achievements of 2020 are as follows:

- NARLabs has devoted to the Intelligent Machinery Sensor Project to implement the domestic development of sensors and signed the cooperation agreement with NSYSU and PMC. Three parties worked together for the sensor application starting with the scraping technology inheritance. TIRI and TSRI are responsible for implementing the project of the "Intelligent Machinery Sensors Service Platform", which assisting the research teams to develop sensing components and modules with mass production potential. Through this project, the sensors under development were introduced into the terminal industry field for verification and onsite tests, and to shorten the gap between research and industrial application so that a Taiwanese sensor research and development cluster was created and the development of sensor autonomy and onsite verification was realized.
- TIRI cooperated with PMC to develop dust sensors (0.3, 0.5, 1.0, 2.0 μm) applied for collecting the data of dust cutting from machine tools. Through an established big database which concluded dust amount and tool condition monitoring data, it is provided to AI analysis. Therefore, the use efficiency of the tool and the yield of processed products could be improved.
- TIRI built up the intelligent environmental monitoring system of the factory. Energy monitoring, analysis, management, and optimization of energy-saving control for equipment was controlled by this system. In addition, it not only supports various sensors and meters but also provides built-in analysis models and intelligent algorithms. Through operations of real-time optimization and adjustment by setpoints, dynamic efficiency prediction management, as well as production efficiency analysis, the operation and maintenance efficiency of major energy-consuming equipment can be greatly improved to promote energy-saving efficiency. The situation of environmental quality, comfort, and energy conservation can be achieved. The system can calculate and determine the optimal operation mode of each unit equipment with its optimization logic and algorithm without changing any existing units and affecting supply quality. The goal of "economic operation (regulation)" was achieved by this system and the energy efficiency could be improved up to 3-15%.



儀科中心與精機中心合作發展粉塵感測器
TIRI cooperated with PMC to develop dust sensors.

Taiwan Instrument Research Institute

國際合作

International Cooperation

儀科中心長期發展光學與真空技術，在國內已建立領先地位，為促成中心成為「國際級儀器科技研發整合卓越中心」，積極推動國際合作，加強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, strengthening interaction with global instrumentation societies, cultivating excellent R&D talents, and advancing its R&D level.

簽署合作備忘錄夥伴
Cooperative Memorandum of Understanding

國研院以推動國際化、打造世界級實驗室為宗旨，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，儀科中心近年來與下列國際單位簽訂合作備忘錄：

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. TIRI currently has cooperative MOUs with the following units:

- 日本獨立行政法人理化學研究所
  RIKEN, Japan
- 捷克科學院物理研究所
  Institute of Physics, Academy of Sciences (FZU), Czech Republic
- 新加坡增材製造創新中心
  National Additive Manufacturing Innovation Cluster (NAMIC), Singapore
- 比利時微電子研究中心
  Interuniversity MicroElectronics Center (imec), Belgium
- 義大利薩尼奧大學
  Università degli Studi del Sannio, Italy
- 日本 Edgecross 聯盟
  Edgecross Consortium (ECC), Japan
- 優力國際安全認證有限公司
  Underwriters Laboratories (UL), USA

儀科中心楊燿州主任率同仁赴日與日本獨立行政法人理化學研究所 (RIKEN) 超穎材料實驗室互訪交流，雙方續簽五年合作備忘錄。
Director General Yao-Joe Yang with TIRI research fellows visited RIKEN and renewed a five-year collaborative MOU.

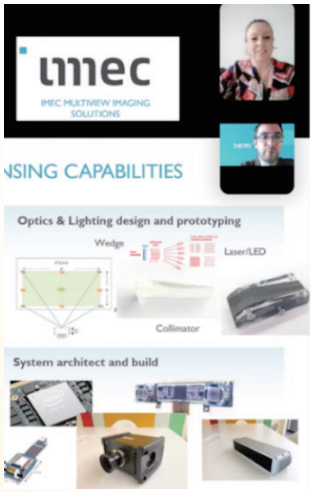
國際頂尖研究機構合作計畫
International Research Cooperation Projects

儀科中心透過與國際學研單位專案委託及共同研究方式進行實質合作交流，合作議題整理如下表所列。

TIRI is conducting preliminary-stage commissioned projects and joint research with international academic and research units, expecting to establish a foundation for formal cooperation. The following is a summary of cooperative projects.

合作單位 Cooperating Unit	合作題目 Subject of Cooperation	年度 Year
日本獨立行政法人理化學研究所 RIKEN, Japan	■ 近紅外波段寬頻可調變式超穎材料 ■ 100 THz 寬頻多層式三維超穎材料之開發 Development of N-IR broadband, multi-layer, three-dimensional metamaterials	2014—2020
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	2014—2021
比利時微電子研究中心 Interuniversity MicroElectronics Center (imec), Belgium	先進影像與光學應用技術 Advanced image and optics applications	2014—2020
優力國際安全認證有限公司 Underwriters Laboratories (UL), USA	生醫環境與建置計畫 Biomedical environment construction project	2017—2020
義大利薩尼奧大學 Università degli Studi del Sannio, Italy	感測器資訊轉換器原型開發 Development of analog-to-information converter (AIC) prototype board	2017—2020
新加坡增材製造創新中心 National Additive Manufacturing Innovation Cluster (NAMIC), Singapore	生醫應用與積層製造技術發展 Biomedical applications and additive manufacturing technology	2018—2021
泰國國家科技發展局 BIOTEC-IBST 實驗室 BIOTEC-IBST of National Science and Technology Development Agency (NSTDA), Thailand	精準醫療之快速基因檢測 Rapid genetic testing for precision medicine	2019—2020

imec 創新服務處處長暨台灣區總經理 Peter Lemmens (左三) 到訪交流
Peter Lemmens, Director of imec Innovation Services and General Manager imec Taiwan Ltd., visited TIRI for further bilateral collaboration.



中心研究人員與 imec 進行視訊討論畫面
TIRI research fellows had a videoconferencing discussion with imec representatives.

參與國際儀器科技組織運作
Involvement in the International Instrument Technology Organizations

儀科中心亦積極參與國際儀器科技組織，以提升國際知名度與組織地位重要性，協助我國儀器專業躍升於國際舞台。儀科中心所參與的國際組織運作列表如下：

TIRI actively participates in international instrument technology organizations, and also hopes to enhance its own international visibility and status. Currently, TIRI participates in the following international organizations:

- 美國機械工程師學會台灣分會
  American Society of Mechanical Engineers (ASME) Taiwan Section
- IEEE 量測與儀器技術學會台北分會
  IEEE Instrumentation and Measurement Society (IMS) Taipei Chapter
- 實驗力學協會
  Society for Experimental Mechanics (SEM)
- 美國真空學會台灣分會
  American Vacuum Society (AVS) Taiwan Chapter
- 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

IEEE TRANSACTIONS ON I&M (TIM) 期刊主編 Shervin Shirmohammadi 教授到訪交流，並深入了解儀科中心儀器客製的服務能量。
Prof. Shervin Shirmohammadi, Editor-in-Chief of IEEE Transactions on I&M (TIM), visited TIRI and understood thoroughly about TIRI's service capability for customized instruments.

Taiwan Instrument Research Institute

技術服務

Technical Service

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，提供真空、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，109 年提供產學研各界檢測與委製服務累計共 1,925 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 have we constantly developed our own instrumentation technologies, but in compliance with our goal of supporting academic research and serving industry professionals, TIRI provides OEM and calibration services for vacuum equipment, optical system, and key components. In 2020 we provided a total of 1,925 testing and OEM services to enterprises, universities and research institutes. TIRI is commissioned by various industries to conduct foresight 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，儀科中心是台灣學術界的最佳盟友與幕後推手。109 年學界合約案件數眾多，僅列舉部分於下表。

Supporting academic researches, promoting national technology developments, 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 2020, only some of whom are listed below.

委託計畫 Project Title	合作對象 Partner
智慧機械感測器服務平台專案計畫 Intelligent Machinery Sensors Service Platform Project	國立清華大學、國立陽明交通大學、國立中山大學等 5 校共計 6 個研究團隊共同參與計畫。 6 research teams from 5 schools (such as NTHU, NYCU, NSYSU, and so on) join in this project.
AQI 氣體感測器服務平台專案計畫 AQI Gas Sensor Service Platform Project	國立清華大學、國立陽明交通大學、國立成功大學等 5 校共計 6 個研究團隊共同參與計畫 6 research teams from 5 schools (such as NTHU, NYCU, NCKU, and so on) join in this project.
人工智慧於醫療用攝影頭燈系統影像之辨識與整合 AI Image Recognition Integrated with the Coaxial LED Headlight Video Recording System	國立臺灣大學 National Taiwan University
客製化 PE-ALD 設備 Customized PE-ALD System	國立中山大學 National Sun Yat-sen University
電子槍斜向蒸鍍系統 Oblique Angle Deposition by E-beam System	國立臺北科技大學 National Taipei University of Technology
鼠腦檢測之大口徑高解析光學顯微系統物鏡 Large Aperture Microscope Objective for Mouse Brain Research	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為使命，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，並厚植及深耕國內儀器技術。2020 年產界合約案件數眾多，僅列舉部分於下表。

Aiming to localize the instrumentation technology, TIRI promotes its R&D capability actively and encourages its teams to respond to the industrial demands. By 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 2020, only some of whom are listed below.

委託計畫 Project Title	合作產業類別 Type of Industry
微流體與生醫晶片整合技術 Technology of Integrating Micro Fluidic and Bio-medical Chip	電子零件產業 Electronic component industry
曝光機之光學元件開發製作 OEM of Lithography Stepper Optical Components	半導體製造業 Semiconductor fabrication industry
原子層沉積 / 蝕刻系統委製案 Atomic Layer Deposition/ Etching System OEM Project	半導體產業 Semiconductor industry
生醫產品開發及驗證 R&D and Verification Service of Bio-medical Products	醫療生技產業 Medical biotechnology industry
結合 AI 影像辨識及雲端技術之醫療病理影像檢測儀器 Combined AI Image Recognition and Cloud Technology with Digital Image Correlation Method for Medical Pathology Image Recognition Instrument	醫療院所 Medical institution
雷射加工系統之光學鏡片製作 Manufacturing of Optical Lens for the Laser Processing System	精密機械業 Precision machinery

TAF 認證實驗室的校正與測試服務
TAF Certification Laboratories

儀科中心建置並持續維持 TAF 認證實驗室，提供真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。另外，生醫平台實驗室的電子醫療器材認證多達 19 項。

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 TAF Certification Laboratories to provide standard vacuum calibration, and optoelectronic inspection and testing services with more than 100 recognized calibration reports annually. In addition, there are as many as 19 electronic medical device certificates of biomedical platform laboratories. The TAF calibration and testing service items are shown on the TIRI website below: https://www.tiri.narl.org.tw/Service/Taf.

人才培育
Talent Cultivation

儀科中心致力培育我國儀器研發高階人才，方式包括開放研究生參與研究計畫，及執行「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，以達知識擴散之目標。

同時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。109 年舉辦的研習班與研討會包括「ALE/ALD 技術交流研討會」、「真空技術研討會」、「儀器技術訓練課程」等，以及開設多場重點產業高階人才培訓課程。

TIRI has cultivated outstanding professional talents for domestic academia via various workshops and seminars, as well as cultivated research manpower required by high-tech industry such as "Rebuild After PhD's Industrial Skill & Expertise (RAISE) Project" in order to enhance the quality and quantity of talents as the foundation for scientific research of our country. There were as many as 30 workshops and seminars organized in 2020, including "ALD /ALE Conference", "Workshop on Practical Vacuum Technology" and "Instrument Technology Training Course" as well as courses related to the cultivation of medical talents.

儀科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。
TIRI has cultivated outstanding professional talents for domestic academia via various workshops and seminars.

儀科中心 109 年報
TIRI Annual Report 2020

發行所 Publishing House

國家實驗研究院台灣儀器科技研究中心｜ Taiwan Instrument Research Institute, NARLabs

發行人 Publisher

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發行日 Publication Date

109 年 4 月｜ April, 2021

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