2018

107年度 | ANNUAL REPORT

台灣儀器科技研究中心年報

Taiwan Instrument Research Institute

2018 年儀科中心年報｜TIRI Annual Report 2018

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主任的話

Words from Director General

台灣儀器科技研究中心以真空、光學與光機電整合等豐厚技術能量，長年來持續在國內扮演「學研後盾、產業推手及國際合作好夥伴」之關鍵角色。儀科中心的研發專業在國內學術界相當獨特，可協助理、醫、工、農等領域的研發團隊，開發各種客製化的儀器設備進行最頂尖前瞻的研究與實驗。2018 年度儀科中心推動的學研合作計畫，合作對象包含臺灣大學、成功大學、清華大學、交通大學等 27 所大專院校及研究單位，多達 94 案。另外，儀科中心推動的全國性科技研發平台計畫，如「物聯網感測器服務平台」專案計畫（跨 17 校 44 團隊）與「智慧機械聯網平台」專案計畫（跨 11 校 8 團隊），成果亦亮麗豐碩。

2018 年儀科中心在國際合作上亦有亮眼成績，在中心與比利時微電子研究中心 (imec) 台灣分公司的長年合作基礎下，促成 imec 總部與國研院簽訂合作備忘錄，未來將共同開發高光譜技術及穿戴式裝置等應用技術，除了有助於提升國研院建立與國際大廠的合作關係，更擴大台灣在儀器科技領域的知名度與影響力。

在推動儀器工程技術發展方面，儀科中心持續推動半導體製程設備與精密檢測儀器在地化，在 2018 年舉行「半導體先進製程及設備研發聯盟交流會 - 光子與原子共舞」，展出自製關鍵設備，媒合產學研協助儀器產業開創商機；儀科中心亦與三鼎生物科技股份有限公司共同成功研發「生物 3D 列印骨骼重建系統」，縮短手術時間，可製作出完全符合病患缺損處形狀的人工替代骨，維持顏面外型不變。

儀科中心首創國際醫療器材認證一站式服務平台，配合政府政策，打造「創新高值醫材產業重鎮」，輔導國內研發團隊申請國際認證及產品上市許可，2018 年的亮點成果包括：協助台灣微動公司取得美國及歐盟的上市許可認證外，並獲得北美知名牙科器械品牌商 AG Neovo Dental 偉聯科技公司的高額採購訂單；與新加坡增材製造創新中心、中國醫藥大學附設醫院共組亞洲第一的 3D 列印醫療產業團隊，引進國際相關資源，協助強化國內醫材產業；與三軍總醫院共同打造「亞太區醫用 3D 列印服務平台」，將 3D 列印技術實際導入臨床，提高醫療品質。值得一提的是，運用本中心在新竹生醫園區的據點進行生醫產業新創輔導，一共輔導 38 個團隊，促成 6 家新創公司成立，促進國內生醫產業之發展與競爭。

人才培育亦是儀科中心的重要的任務。我們透過舉辦學生實作競賽「國研盃智慧機械競賽」與「國研盃 *i*-ONE 儀器科技創新獎」，建構一個鼓勵開放學習的自造者交流平台，促使參賽者運用基礎學理知識，發揮創造力解決問題，享受實作樂趣。

最後，要與各位先進分享一好消息，在儀科中心將成立將滿 45 周年的前夕，獲准正式將中心名稱冠上「台灣」兩字，全名變更為「台灣儀器科技研究中心」。我們將持續帶領台灣儀器科技的研發，開發最先進之關鍵元件、組件與系統，也將持續支援學術研究、建構儀器技術平台，且持續與產、學、研各方進行合作交流與整合，推展各項研發與服務。

Taiwan Instrument Research Institute (TIRI), formerly known as ITRC, has always been the powerful ally for the academia, industry and research bodies in Taiwan and across the globe. With the sophisticated experience in vacuum technology, precision optics & machining, and opto-electro-mechanical integrations, TIRI has the strong capability to provide extraordinary instrumentation R&D services for almost all science, medicine and engineering fields in academia. It is our expertise to develop customized instruments and

equipment for advanced research works. In 2018, there were a total of 94 academic research cooperation projects, involving 27 universities and research institutes such as NTU, NCKU, NTHU, NCTU and so forth. Moreover, TIRI jointly executed “Internet of Things (IoT) Sensors Service Platform Project” (44 teams out of 17 schools) and “Smart Machinery Service Platform Project” (8 teams out of 11 schools) with outstanding achievements.

Regarding the international cooperation in 2018, TIRI has made great progress on our long-term collaboration with Interuniversity Microelectronic Centre (imec) Taiwan Co. We promoted the signing of cooperation MOU between NARLabs and imec. TIRI and imec are moving forward to develop hyperspectral technologies in wearable devices together. The collaboration is expected to enhance the relationship between the NARLabs and global major companies, and to expand the reputation and influence of Taiwan in the field of instrument technology.

In addition, TIRI continues to help strengthen the domestic R&D capabilities of developing semiconductor process equipment and precision inspection instrument. In 2018, TIRI organized the “Annual Meeting of Semiconductor Process and Equipment R&D Alliance”. More than 120 experts from industries and academia join the events. TIRI also demonstrated a few advanced equipment and key components, targeting to accelerate academia-industry translation for entrepreneur initiative. Moreover, TIRI hosted the launch announcement of “Biological 3D Printing Bone Reconstruction System” to showcase the collaborative outcome by TIRI, Taipei Medical University, and 3D Global Biotech Inc. The “Biological 3D Printing Bone Reconstruction System” can efficiently shorten surgery time by 3D printing artificial bone, which completely matches the shape of patients’ missing part without changing their appearance.

Furthermore, TIRI has established the first one-stop service platform conformed to international medical device regulations in coordination with government policy to create the “Powerhouse of Innovative High Value Medical Device Industry”. This platform effectively assisted the domestic R&D teams in applying for international certificates and product marketing authorization. In 2018, we have accomplished the followings. First, we assisted MicroP Technology to acquire marketing authorization in US and EU, and secured the high-value purchase order of AG Neovo Dental, the renowned dental equipment brand in North America. Second, we partnered with China Medical University Hospital of Taiwan and National Additive Manufacturing Innovation Cluster (NAMIC) of Singapore to form the first Asian team in 3D printing

medical device industry. Through this cooperation, it is expected to bring in more global resources and strengthen domestic medical device industry. Last, TIRI established the “Asian-Pacific Medical 3D Printing Service Platform” with Tri-Service General Hospital to enhance the quality of medical care with 3D printing technology in clinical applications. It is worth mentioning that the Biomedical Platform & Incubation Services Division of TIRI at Hsinchu Biomedical Park has counseled 38 teams in biomedical industry and assisted the founding of 6 startups. TIRI has constantly devoted to the development of domestic biomedical industry.

Talent cultivation is also an important task for TIRI. By holding competitions such as “NARlabs Smart Machinery Competition” and “NARLabs *i*-ONE Instrument Technology Innovation Competition”, we have established platforms to encourage young makers to demonstrate their hands-on capabilities in developing opto-mechatronic systems as well as instruments. Participants are prompted to solve problems with fundamental science knowledge and creativity, and then enjoy the process of practice.

In the end, I would like to share a great news with all the friends around the world. Before celebrating the 45th anniversary, our institute has officially renamed as “Taiwan Instrument Research Institute” (TIRI), approved by the Ministry of Science and Technology. In the future, TIRI will continuously serve as the pioneer in the domestic instrument-related research, providing key components, system design and fabrication services. We will also sustainably support the academia research and establish service platforms. Through the collaboration and integration with all our partners from the academia, industry and research fields, TIRI has confidence in fulfilling our mission to offer various sorts of R&D innovation and services.

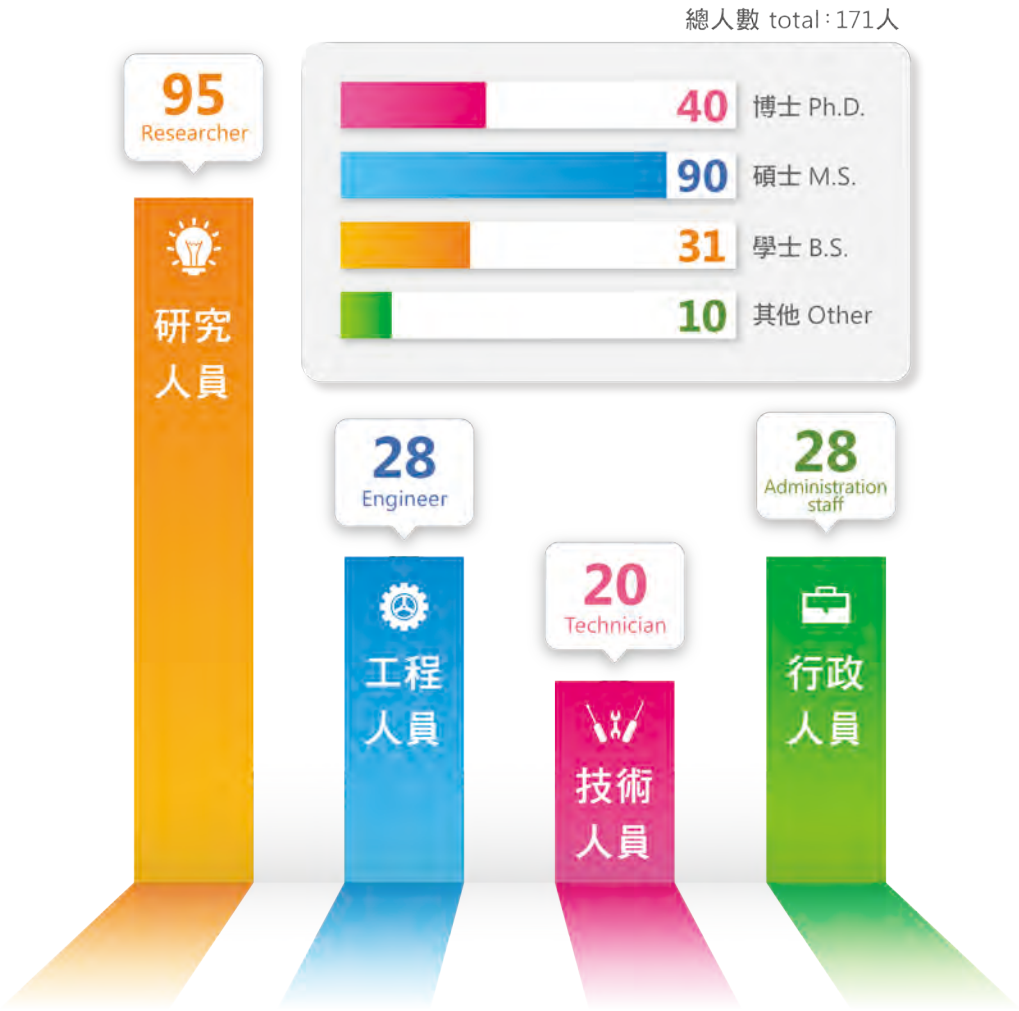
基本概況

Overview of TIRI

Taiwan Instrument Research Institute

組織架構 | Organization Chart

人力配置 | Deployment of Manpower



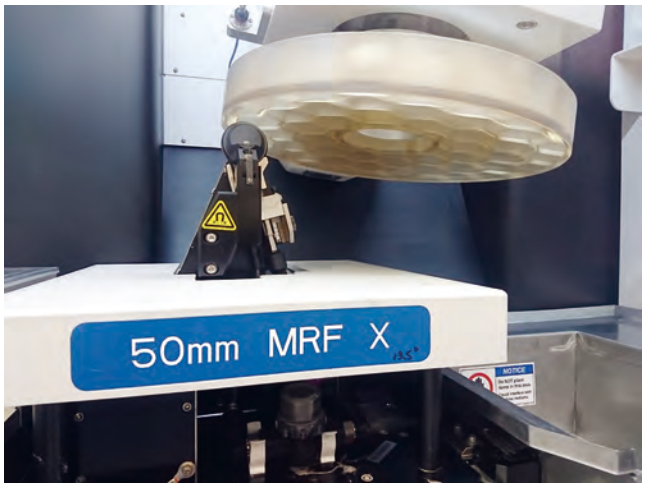
核心設施 | Core Facilities

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

超過 40 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 40 years of experience in precision optics and machining, TIRI provides precision opto-mechanical device and system design & manufacturing services. We are the only organization which can provide fabricating service for large 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 Large-aperture 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



(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：

- 大口徑鏡片鍍膜系統 Large-aperture Lens Coating System
- 高密度電漿濺鍍系統 High Power Impulse Magnetron Sputtering, HiPIMS
- 像差修正掃描穿透式電子顯微鏡 Aberration Corrected Scanning Transmission Electron Microscope (STEM)
- 8 吋批次式 3D 結構原子層沉積系統 8” Batch-type 3D Structure Atomic Layer Deposition System

(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：

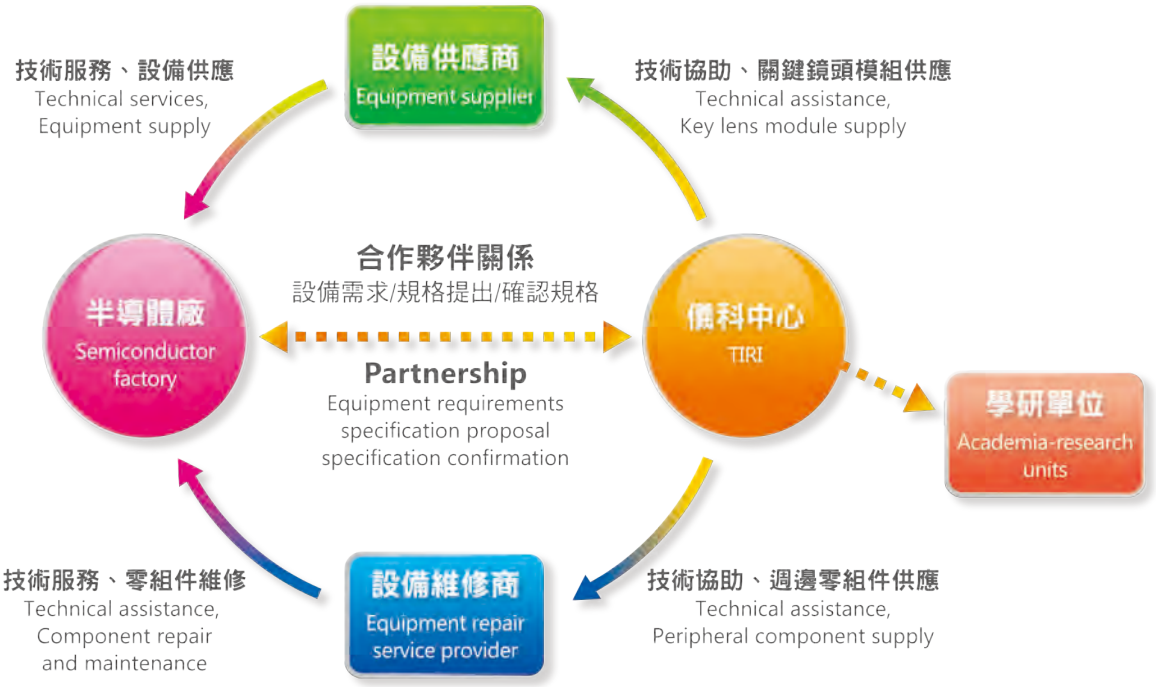
TIRI established and maintained the Medical Device Testing & Verification Laboratories in Hsinchu Biomedical Science Park, which conform to international medical device regulations. The laboratories provide one-stop shop service to accelerate the medical product launch. The major core facilities include:

- 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

商業合作模式 | Business Cooperation Model

儀科中心積極導入「服務客戶的客戶」新營運模式，銜接上下游廠商間的產品供需、或學研間的研發落差，將消費者端的需求，研發並轉譯成供應者的能量；並藉由「創新精進技術、技術精進服務」理念，加速研發創意轉化成產業應用，擴大產業鏈的服務加值效益。下圖以半導體廠為例，所進行的營運模式。

TIRI actively introduces a new operating model of "servicing customers of customers", and bridges the gap between the product supply and demand of upstream and downstream firms as well as in the R&D of academic institutions to research, develop, and translate the demands at the consumer end into capacities at the supplier end. Tapping on the novel service concept of “Drive Technology Innovation to Promote Academic Research”, TIRI accelerates the transformation of R&D and innovative outcomes into industry applications, thereby adding value to the services of our industry chain. The diagram below illustrates the operating model of a semiconductor factory.



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 Promoting popular science education (Talent Cultivation)

- 福衛五號的遙測儀
  Serving as the RSI of the FORMOSAT-5 satellite
- 災防用濁水溪橋梁監測儀器
  Developing a monitoring device for disaster prevention at the Zhuoshui River Bridge
- 協助精準農業發展
  Assisting with refining agricultural development
- 執行「生技產業起飛行動方案」
  Executing the "Biomedical Industry Innovation Promotion Program"

- 國研盃 ***i*-ONE** 儀器科技創新獎
  Hosting NARLabs *i*-ONE Instrument Technology Innovation Competition
- 國研盃智慧機械競賽
  Holding NARLabs Smart Machinery Competition
- 儀器技術人才培育與科普教育
  Fostering talents in instrument technology and promoting popular science education
- 科儀新知、儀科中心電子報
  Updating knowledge and information via publishing Instruments Today and TIRI eNews
- 光電展、半導體展、國際光電工程學會 (SPIE) 展覽等
  Joining optoelectronics exposition, SEMICON, and SPIE exhibition

支援產業所需儀器系統與關鍵元組件
Assisting to improve industry-specific instruments and key components, such as :

- 曝光機鏡片銷售至指標性產業
  Lens and optical filters for i-line stepper
- 開發曝光機
  E-pin Wafer E-pin in lithography equipment
- 開發 **LED** 晶粒檢測系統
  LED chip inspection systems
- 開發整合自動檢測系統於晶粒檢測
  AOI module integrated in chip sorter machine

- 支援國家型計畫、深耕計畫
  Supporting government policy-based projects and enhancement projects
- 支援創新創業計畫原型製作
  Supporting innovation, entrepreneurial projects, and prototype production
- 生醫團隊育成輔導與醫材驗證
  Cultivating biomedical teams and verifying medical devices
- 合作研發，支援前瞻研究所需儀器科技與特用儀器系統
  Cooperating with academic institutions in the R&D of instrument technologies and systems specific for prospective studies

亮點成果與大事紀要

Notable Achievements & Milestones in 2018

Taiwan Instrument Research Institute

2018/03/03

儀科中心協同美國機械工程師學會 (ASME) 台灣分會舉辦「2018國研盃智慧機械競賽」學生競賽(SPDC)，學生創客齊聚機械擂台，打造 C 羅機器人。

TIRI worked with ASME Taiwan to organize 2018 NARLabs Smart Machinery Competition (ASME Taiwan Student Professional Design Competition (SPDC). Student makers all gathered to participate in the “Student Design Competition” and “Old Guard Oral Presentation Competition”. The topic of “Student Design Competition” was “Robot Football: Goooaaalll!!!”.

2018/03/27

簽約儀式：(左起) NAMIC Managing Director Ho Chaw Sing、**國研院王永和院長、中國醫藥大學附設醫院周德陽院長**
MOU signing ceremony: NAMIC Managing Director Chaw Sing Ho, President of NARLabs Yeong-Her Wang, and Dean of China Medical University Hospital De-Yang Cho (from e left).

國際合作 連接在地 連結國際 連接未來
International Cooperation – from Local to Global, Looking forward to the Future

國研醫材創價聯盟鏈結中國醫藥大學附設醫院與新加坡增材製造創新中心於 3 月 27 日三方簽署合作備忘錄。這是國研醫材創價聯盟首次簽署之國際合作，已選定骨板設計為合作題目，並以申請 FDA 為目標，由新加坡大學及新加坡國立大學醫院提供臨床產品需求，國研院儀科中心與動物中心提供一站式服務平台，協助進行器械測試數據驗證、生物相容性測試、動物研究。

NARLabs Medical Device Alliance, China Medical University Hospital (CMUH) of Taiwan and the National Additive Manufacturing Innovation Cluster (NAMIC) of Singapore signed Memorandum of Understanding (MOU) on March 27th, 2018. This is the first international cooperative MOU signed by NARLabs Medical Device Alliance. The structural design for bone plate will be the first cooperation topic and targeting the FDA application. Under the MOU, The National University of Singapore and National University Hospital will provide clinical product requirements. TIRI and National Laboratory Animal Center will provide one-stop service platform in device testing, data validation, biocompatibility testing, and animal research.

2018/05/09

學研合作專案計畫聯合期末成果展示會，打造我國 AI 好時代

Joint R&D Fair and Exhibition of IoT Sensors and Smart Machinery Projects for Creating the AI Era in Taiwan

儀科中心主執學研專案計畫，於 5 月 9 日舉辦「物聯網感測器服務平台」暨「前瞻智慧型機器人模組開發與系統整合」學研合作專案計畫期末成果展示會。「物聯網感測器服務平台」跨 17 校 44 團隊，已有 4 組穿戴式裝置與個人照護計畫開發之感測器模組，成功取得教學醫院與長照機構的臨床試驗許可，預計在兩年內量產並在台上市。「智慧機械聯網平台」則跨 11 校 8 團隊，串聯學術界加工設備，使其製造資訊透過平台達成共享與協同服務之效，進而帶動國內機械製造產業翻轉營運模式。

TIRI facilitated the academia-research cooperation projects and organized the Joint R&D Fair and Exhibition (i.e. demo and talk show) of the “IoT Sensors Service Platform Project” and the “Advanced Intelligent Robotic Module and System Integration” on May 9th. There were 44 teams from 17 universities involved in the “IoT Sensor Service Platform Project”. So far, four sets of wearable sensors module applied to personal medical care have permitted to perform the clinical trials in medical centers or long-term care organizations. Meanwhile, 8 teams from 11 universities involved in the “Smart Machinery Service Platform Project” also demonstrated the industrial IoT setup and applications. TIRI integrated inter-university machining equipments and showed the big data collection applied to smart manufacturing situation. The situation demonstration will benefit the industrial 4.0 talent education and manufacturing industry reform.

儀科中心主執學研專案計畫於 5 月 9 日舉辦成果展示會
Joint R&D Fair and Exhibition of IoT Sensors and Smart Machinery Projects facilitated by TIRI was organized on May 9th.

2018/05/29

打造「亞太區醫用 3D 列印服務平台」暨「國醫中心醫用 3D 列印中心」

Creating "Asian Pacific Medical 3D Printing Service Platform" and "National Defense Medical Center Medical 3D Printing Center"

儀科中心與三軍總醫院為推動醫學 3D 列印技術於臨床研究及應用發展合作，並共同建構「3D 列印服務平台」，於 5 月 29 日簽訂合作備忘錄。10 月 13 日三軍總醫院結合該院 3D 列印中心及儀器科技研究中心於新竹生醫園區積層製造實驗室的技術，為罹患『先天性脛骨假關節症』9 歲蒙古男童阿莫進行「截骨手術」，在手術前先重建電腦斷層影像並重組成 3D 圖像，再透過 3D 列印技術列印出阿莫的 1:1 骨頭模型，藉此模型讓醫師於術前有更明確的概念，並使手術更精準執行。

In order to promote medical 3D printing technology and jointly construct a "3D printing service platform", TIRI and Tri-Service General Hospital (TSGH) signed a cooperative Memorandum of Understanding on May 29th, 2018. On Oct. 13th TSGH conducted a "bone surgery" for the 9-year-old Mongolian boy Amo, who suffered from congenital sacral pseudoarthrosis. With the technologies of the Medical 3D Printing Center at TSGH and TIRI's Additive Manufacturing Laboratory located at Hsinchu Biomedical Science Park, the computerized tomographic image and 3D image were reconstructed and reorganized successfully before the surgery. With Amo's 1:1 3D printing bone model, the physicians were capable to have a clearer concept before surgery, and then conducted the surgery more accurately.

在國研院王永和院長（左一）及軍醫局陳建同局長（右一）見證下，國研院儀科中心楊燿州主任（左二）和三軍總醫院蔡建松院長（右二）簽訂「亞太區醫用 3D 列印服務平台」合作備忘錄。

Witnessed by President of NARLabs Yeong-Her Wang (first from the left) and Director General of Medical Affairs Bureau Jiann-Torng Chen (first from the right), Director General of TIRI Yao-Joe Yang (second from the left) and Dean of Tri-Service General Hospital Chien-Sung Tsai (second from the right) signed the cooperative MOU of “Asian-Pacific Medical 3D Printing Service Platform”.

2018/07/26

儀科中心參與南臺灣國際產學聯盟、台灣自立支援照顧專業發展協會之結盟，成立國內第一個智慧健康照護平台。期望未來透過國研院所成立的「國研醫材創價聯盟」的加速器服務平台，一次解決高階醫材研究開發所需各種服務，發揮最大效益。

TIRI was involved in the establishment of the first domestic smart healthcare service platform with the alliance partners, GLORIA and Taiwan Self-Supporting Care Professional Development Association. Through the accelerator service platform of “NARLabs Medical Device Alliance”, it is expected that TIRI can maximize our services and provide various services to meet the R&D demands of high-end medical device industry.

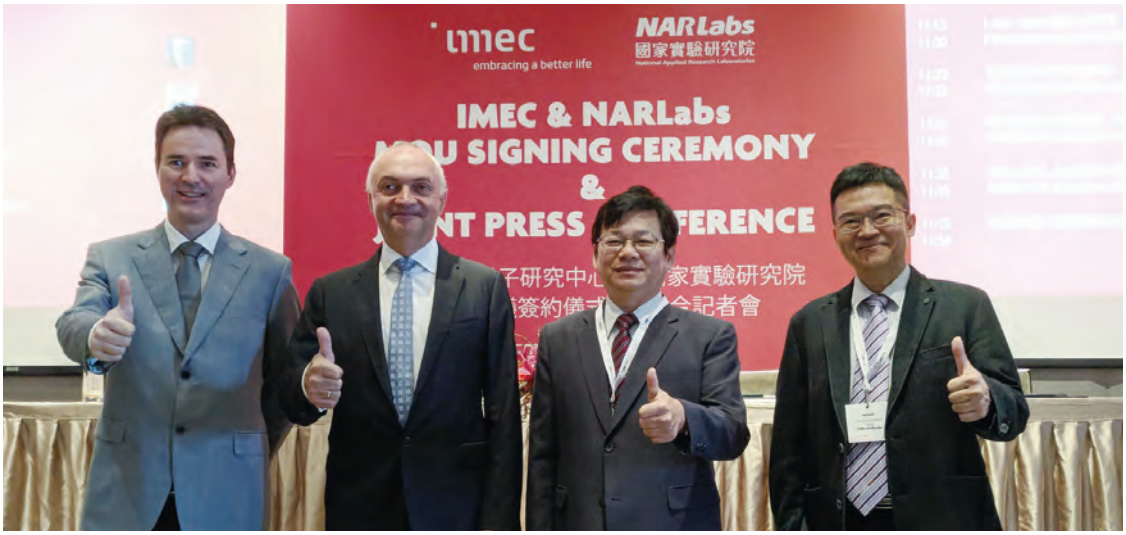
2018/09/20

促成本院與比利時微電子研究中心 (imec) 簽訂 MOU，攜手研發先進影像與光學應用技術

The MOU Signing between NARLabs and imec TIRI and imec collaborate on advanced imaging and optics applications.

儀科中心自 2014 年即與比利時微電子研究中心台灣實驗室進行共同研發，在多項合作計畫中取得豐碩的成果，在此合作基礎與經驗上，促成 imec 與本院簽訂合作協議備忘錄，未來將共同開發顯微高光譜應用技術。

Starting the cooperation since 2014, TIRI has built a great relationship with imec Taiwan Co., and therefore, both sides gratefully decided to sign the MOU for a closer cooperation on advanced hyperspectral imaging technology.



imec 與國研院簽訂 MOU 儀式
MOU signing ceremony between imec and NARLabs.

2018/09/20

儀科中心舉辦「2018 原子層沉積技術發展與產業應用研討會」，本研討會邀請國外前驅物材料專家以及國內知名學者，除了介紹 ALD 技術在各領域的應用外，更藉此機會展示中心發展 ALD 技術的相關成果，強化中心與產學界的聯繫。本中心也將持續扮演橋梁的角色，聯結學界以及產業界，提供雙方合作契機以及平台，促進 ALD 技術在國內成長茁壯。

TIRI organized “2018 Atomic Layer Deposition (ALD) Technology Development and Industrial Application Seminar”, and invited well-known foreign precursor material experts and scholars. In addition to introducing the ALD applications in various fields, it was a good opportunity to show the achievements of TIRI’s ALD technology. On the other hand, it also strengthened the connection among TIRI, the academia and industry. In the future, we will continuously bridge the academia and industry, and assist the development of ALD technology in Taiwan.

2018/09/21

儀科中心舉辦「半導體先進製程及設備研發聯盟」交流會，邀請近 150 名國內半導體曝光設備研發與製程領域之學研專家與國內外半導體領域業界專家，展出自製關鍵元件與設備，邀請學研產業界之先進共聚交流。此成果將成為台灣發展半導體產業發展最佳的基礎與後盾。

TIRI hosted the seminar of “Semiconductor Process and Equipment R&D Alliance” and invited nearly 150 experts from the semiconductor industry and the related-field scholars. The optical key components designed and fabricated by TIRI were demonstrated in the seminar. The optical key components and modules for i-line stepper include projection lens, filters, rema lens, illumination lens, and aspherical lens. The i-line stepper developed by TIRI will apply to advanced IC packaging process, such as 3D IC TSV. This result is expected to serve as the best foundation and driving force for the development of semiconductor industry in Taiwan.

2018/10/06

舉辦第 10 屆「國研盃 *i*-ONE 儀器科技創新獎」，為台灣培育未來關鍵儀器設備自製開發的人才與能力。「國研盃 *i*-ONE 儀器科技創新獎」提供一個平台，鼓勵同學們將理論落實於實作，培養動手操作、實現創意的能力與經驗，進而促進學習的動機與企圖心。

The 10th NARLabs *i*-ONE Instrument Technology Innovation Competition was organized to cultivate future talents with independent research and development capabilities of key equipment in Taiwan. Through *i*-ONE competition, students are encouraged to realize their creativity by the theoretical practice and develop the hands-on interest thus contributing the motivation and initiative of learning.

2018/11/29

研發「生物 3D 列印骨骼重建系統」，縮短手術時間，維持顏面外型不變

Development of “Biological 3D Printing Bone Reconstruction System” to Shorten Surgery Time and Keep the Facial Appearance Unchanged

儀科中心與三鼎生物科技股份有限公司共同成功研發「生物 3D 列印骨骼重建系統」。相較傳統手術，該技術無須切下口腔癌患者腿部腓骨或手臂橈骨，來填補下顎骨缺損部分，手術時間縮短一半；其次，3D 列印係根據病患下顎骨缺損處量身訂做，可製作出完全符合病患缺損處形狀的人工替代骨，而能維持顏面外型不變。

TIRI worked with 3D Global Biotech Inc. to successfully develop “Biological 3D Printing Bone Reconstruction System”. Comparing with traditional surgery, this technology does not require cutting the tibia or arm tibia of the patient with oral cancer to fill the defect of the lower jaw. In this way, the surgery time can be shorten by half. Furthermore, the 3D printing artificial bone can perfectly match the defect of the patient’s lower jaw, so his/her facial appearance is unchanged.

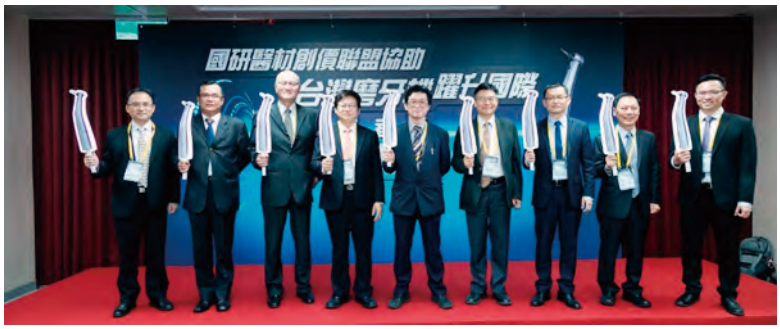
2018/11/30

協助台灣微動公司磨牙機，快速通過國際驗證，並獲得 AG Neovo Dental 偉聯科技股份有限公司的採購訂單，挺進北美市場。

TIRI assisted MicroP’s tooth grinder to quickly acquire international certificate and secure purchase order of AG Neovo Dental to set foot in the market of North America

儀科中心主導之「國研醫材創價聯盟」協助新創公司台灣微動於兩年內取得醫療器材 ISO 13485:2016 品質驗證、歐盟 CE Mark 上市許可，及美國 FDA 510(k) 上市許可，是通過國際市場三項審核最快速的台灣廠商；並獲得北美知名牙科器械品牌商 AG Neovo Dental 偉聯科技公司的採購訂單，挺進北美市場。成功輔導新創公司又添一例，國研院特此於 11/30 舉辦「新創醫材廠商快速進軍國際儀式」，彰顯聯盟對台灣醫材產業之具體貢獻。

TIRI led the “NARLabs Medical Device Alliance” to help the startup MICROP to acquire medical device ISO13485:2016 quality certificate, EU CE Mark marketing authorization, and US FDA510 (k) marketing authorization within two years. It is the quickest Taiwan company that receives the approval of these three global accreditation bodies. It also secured the purchase order of the renowned dental instrument brand in North America, AG Neovo Dental, to set foot in the market of North America. This is another example of successful counseling of startup. NARLabs hosted the ceremony of “Fast Entry of International Market by Medical Device Startups” on November 30th to demonstrate the specific contribution by this appliance to domestic medical device industry.



新創醫材廠商快速進軍國際儀式，電檢中心副執行長林宗清（左起）、鑫科材料副總經理林景扶、TUV 台灣德國萊因董事總經理劉化傳、國研院院長王永和、科技部次長謝達斌、國研院儀科中心主任楊燿州、台灣微動董事長王識鈞、AG Neovo Dental 偉聯科技董事長俞允、榛品牙科院長陳欽章。
Ceremony of Fast Entry of International Market by Medical Device Startups (from the left) Vice CEO of Electronics Testing Center Tsung-Ching Lin, VP of TTMC Ching-Fu Lin, Managing Director of TÜV Rheinland Taiwan Max Lyou, President of NARLabs Yeong-Her Wang, Deputy Minister of Ministry of Science and Technology Dar-Bin Shieh, Director General of TIRI Yao-Joe Yang, Chairman of MicroP Technology Stanley Wang, Chairman of AG Neovo Dental Yun Yu, and Dean of Jen-Pin Dental Clinic Chin-Chang Chen.

2018/12/08

儀科中心舉辦「光學系統整合研發聯盟 2018 交流研討會」暨「國研院儀科中心技術服務推廣說明會」，整合產、學、研資源，促進交流合作。

TIRI hosted the 2018 joint winter seminar of Optical Systems Integration R&D Consortium and TIRI Technical Service Promotion. We invited our partners and experts from academia, industry, and research institutes to join in this event. TIRI, serving as the bridge between academia and industry, expects to create more opportunities for conversations and collaboration.

2018 年獲獎記錄

活動 Event	參賽作品 Participating Work	獲獎項目 Award
2018 年行政院傑出科技貢獻獎 2018 The Executive Yuan Award for Outstanding Science and Technology Contribution	靛青綠手術區域即時目視導引系統 ICG Fluorescence Onsite Visualization and Assessment System	工程領域 Engineering field
中華民國光電學會 107 年度光電科技貢獻獎 2018 Optoelectronic Technology Contribution Award of the Taiwan Photonics Society	靛青綠手術區域即時目視導引系統 ICG Fluorescence Onsite Visualization and Assessment System	光電科技貢獻獎 Optoelectronic Technology Contribution Award
中華民國計量工程學會「第 18 屆傑出計量工程師獎」 Chinese Metrology Society “The 18th Outstanding Metrology Engineer Award”	蕭健男博士傑出工程師 Dr. Chien-Nan Hsiao, Outstanding Metrology Engineer	第 18 屆傑出計量工程師獎 The 18th Outstanding Metrology Engineer Award
第十二屆國家實驗研究院傑出科技貢獻獎 The 12th NARLabs Outstanding Scientific Contribution Award	先進高能電漿 / 離子輔束助真空鍍膜技術發展 Development of advanced high-energy plasma/ion auxiliary beam vacuum deposition technology	技術發展類 Technology Development-Outstanding Award
第十二屆國家實驗研究院傑出科技貢獻獎 The 12th NARLabs Outstanding Scientific Contribution Award	IoT 感測器驗證平台研發暨相關產業應用 IoT sensor verification platform development and relevant industrial applications	科技服務類 Academic Research-Outstanding Award
第九屆國家實驗研究院傑出服務貢獻獎 The 9th NARLabs Outstanding Service Contribution Award	「Networking ！採購資訊系統核銷作業線上平台建置與網絡加值應用」 “Networking! Establishment of online platform for the write-off operation of procurement information system and the network value-added application.	傑出服務貢獻獎 Outstanding Service Contribution Award

儀器科技發展

Development of Instrument Technology

Taiwan Instrument Research Institute

生物 3D 列印骨骼重建系統

Biological 3D Printing Bone Reconstruction System

儀科中心與三鼎生技合作開發「生物 3D 列印骨骼重建系統」，使用生物相容性骨骼填充物、病患自體生長因子與生物膠體當作列印材料，直接 3D 列印出病患缺損的顎骨。此開發有兩大好處：首先，不必刀切病患的腓骨或橈骨，手術時間縮短一半，也不必進行肢體的復健；其次，3D 列印係根據病患下顎骨缺損處量身訂做，可製作出完全符合病患缺損處形狀的人工替代骨，而能維持顏面外型不變。

TIRI worked with 3D Global Biotech Inc. to develop “Biological 3D Printing Bone Reconstruction System”, in which the biologically compatible bone filler, autologous growth factors, and biological water gel are used as the printing material for direct 3D printing of the missing lower jaw bone. There are two major advantages of this development: first of all, we don’t need to cut off the patient’s tibia and arm tibia, so the surgery time can be reduced by half; which means there is no need for limb rehabilitation. Secondly, the 3D printing artificial bone can perfectly match the defect of the patient’s lower jaw, so his/her facial appearance is unchanged.

System specifications :

- 最大成形尺寸 Maximum forming size：15 ×15 ×10 cm^3
- 列印材料 Printing materials：骨骼填充物 bone filler + 生長因子 autologous growth factors + 生物膠體 biological water gel
- XY 解析度 XY resolution：0.01 mm
- 每層解析度 Resolution per layer：0.4 mm
- 噴嘴直徑 Nozzle diameter：0.8 mm
- 列印速度 Printing speed：3 mm/s

左圖：生物 3D 列印骨骼重建系統；右圖：印製下顎骨修補示意圖。
Left: biological 3D printing bone reconstruction system; Right: illustration of printed bone of lower jaw.

開發符合臺灣標竿企業需求之線上即時檢測鍍膜板材 CIGS 太陽能板材 AOI 系統

Development of the AOI System for In-line Inspection of CIGS Solar Panel to Meet the Requirements of Benchmark Enterprise in Taiwan

本中心結合自主開發之大面積高速線掃描光學取像系統與量檢測技術，研製符合臺灣標竿企業需求之線上光學檢測系統機台，以利於即時調整設備與製程參數，可避免生產不良品之損失。系統設備已與太陽能板量產產線完成系統整合，以即時監控生產設備狀況及板材生產品質。可檢測項目包括鍍膜帶寬、切割線之線寬與直線度、污染微粒或鍍膜剝落、鍍膜邊緣崩缺等；板材 1.22 x 0.62 平方公尺之取像時間＜ 20 秒、檢測正確率 ≧ 98%。

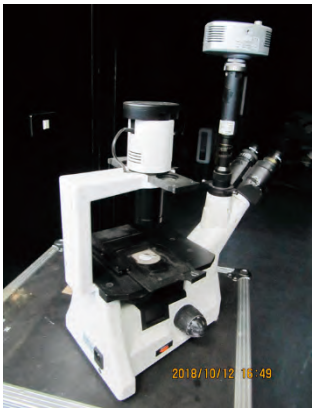
TIRI has developed an in-line Automatic Optical Inspection (AOI) equipment by integrating an opto-mechanical system with an arrayed line scanners and inspection technology for large-scale solar panels to meet the requirements of benchmark enterprise in Taiwan. Therefore, the parameters of manufacture equipment and processes can be adjusted in real-time to avoid the losses resulted from the unqualified products. The equipment has been integrated with the system of mass production line of CIGS solar panel to real-time monitor the status of production equipment and panels quality. The inspection items include the width of coated zone, line width and linearity of cutting lines, contaminant particles or peeled area of coating, and the area of coating collapse along the cutting lines. The image acquisition time for each panel with 1.22m x 0.62m is less than 20 seconds, and the inspection accuracy is greater than 98%.

可應用於生醫檢測的顯微高光譜系統

Hyperspectral with Microscopic System for Bio-Medical Test

儀科中心設計並整合高光譜儀與顯微鏡頭，建構具有高空間解析及光譜解析之顯微高光譜儀光學模組，以開發高光譜生醫檢測技術與系統。將與醫療團隊合作建置生物檢體及高光譜影像頻譜特徵資料庫，利用生物檢體光譜的差異性，提昇生物檢體進行生醫檢測的檢測與判識能力。

TIRI designed and integrated hyperspectral instrument and microscope lens to produce the microscopic hyperspectral optical module with high spatial resolution and spectrum resolution in order to assist the hyperspectral technology applied both at the biomedical and microscopic researches. We will work with medical team to establish biometric and hyperspectral image spectral feature database in order to use the difference of biometric spectrum to enhance the test and interpretation capability of biomedical test of biological specimen.



System specifications :

- 空間解析度 Spatial resolution：2 μm
- 光譜範圍 Spectrum range：400 to 1000 nm
- 120 光譜通道 120 spectrum channels
- 單一光譜通道 single spectrum channel：5 nm

可快速且簡易進行光二極體檢測的陣列晶粒點測系統

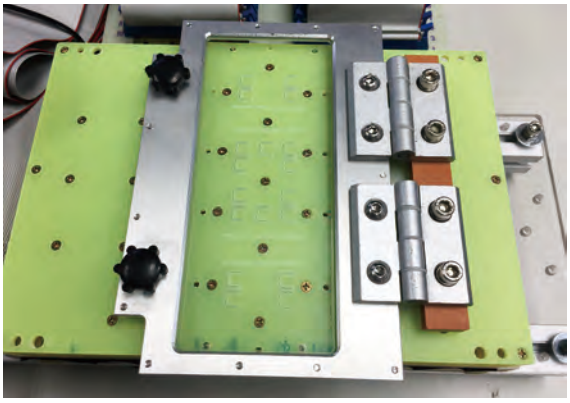
Chip Array-prober and Tester for Quick and Simple LED Test

晶元光電有限公司委託儀科中心客製開發點測系統，藉由獨立限流電阻連接探針卡與發光二極體驅動電路板，可同時點亮發光二極體並進行測試其光電特性。其功用在於快速且簡易的進行光二極體之檢測。使用此陣列晶粒點測系統，無需事先製作打件積體電路元件於電路板上，即可進行良率測試，降低測試成本。

Epistar commissioned TIRI to develop the customized LED chip prober and tester. With independent current limiting resistor connected to probe card and LED driving circuit board, LED can be simultaneously turned on for testing its optoelectronic characteristics. The function is quick and simple LED test. With this chip array-prober and tester, the yield test can be done without the need for fabricating IC device on the circuit board, which can reduce the test cost.

System specifications :

- 可使用 1000 組探針 Vertical probe card with 1000 pin
- 5V 電壓檢測 5V voltage test
- 分區點亮共 20,000 顆 LED 晶粒 It can turn on a total of 20,000LED chips



可應用於子宮頸癌細胞之病理分析的智慧影像生醫檢測系統

Intelligent Biomedical Measurement System for Pathological Analysis of Cervical Cancer Cells

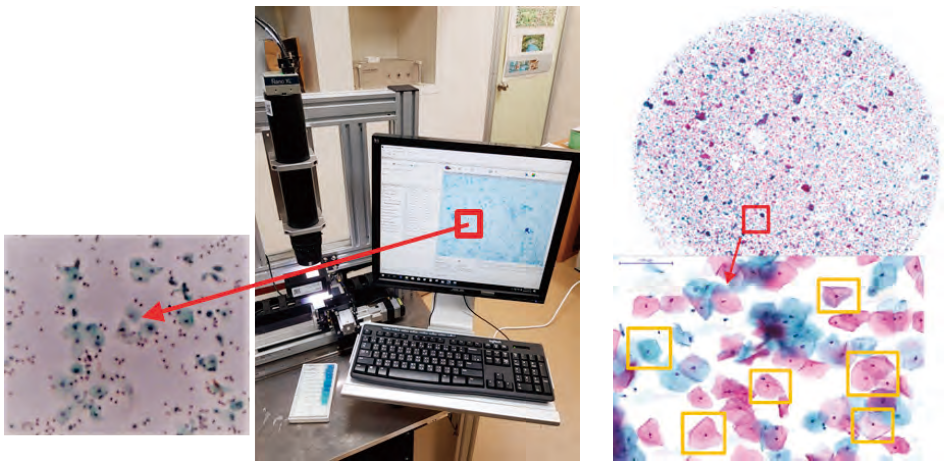
本中心與義大醫院合作，由義大醫院提供子宮頸癌細胞之特徵圖片，來進行病理切片細胞分類，建立以人工智慧為影像分辨核心，透過影像深度學習的方式建立分辨癌細胞之病理分析平台。此平台可延伸應用於檢測攝護腺組織、子宮頸抹片、泌尿細胞檢測等相關領域。

In the cooperation between TIRI and E-DA Hospital, E-DA Hospital provided characteristic images of cervical cancer cells for pathological section cell classification, and we established the pathological analysis platform based on deep learning and artificial intelligence. The application of this platform can be extended to the measurements in the fields of prostate tissue, pap smear, and urinary cells.

System specifications :

- 光學與數位倍率 Optical and digital magnification：100X
- 面型 CMOS 影像感測器，空間解析度為 2 μm Area CMOS image sensor with spatial resolution of 2 μm
- 掃描機構平台 Scanning mechanism platform：運動與震動偏差 motion and vibration deviation <0.5 pixel、掃描定位精度 scanning positioning precision <3 μm

- 影像融合偏差 Image fusion deviation <0.25 pixel



左圖：尿液試片液基影像、右圖：子宮頸細胞液基影像
Left：The liquid-based image for urine cytology;
Right：The liquid-based image for cervix cytology

自研自製 12 吋原子層蝕刻系統開發

Development of Homemade 12-inch Atomic Layer Etching (ALE) System

儀科中心積極投入自研自製高階半導體原子層蝕刻系統設備，整合國家研究單位與產學界研發能量，推動產學研鏈結，加值我國半導體下世代高功率元件製造與先進半導體設備自製的技術能力。原子層蝕刻系統為下世代半導體關鍵蝕刻設備，可應用在 10 / 7 nm 甚至更小的技術領域，本計畫將以氮化鎵綠色功率元件材料做為原子層蝕刻軟硬體測試，來調整修正機台軟、硬體設計，完成電漿輔助原子層蝕刻系統功能性驗證。

TIRI is actively engaged in developing homemade advanced semiconductor atomic layer etching (ALE) system by integrating the R&D capabilities of national research institutes and industry-academia partners. This project promotes a strong academia-research-industry link and upgrades fabrication technique for producing next-generation high power semiconductor devices and self-manufactured competence for advanced semiconductor equipment. Atomic layer etching system is the key etching equipment of next-generation semiconductor fabrication processes in less than 10/7 nm levels. This project adopts GaN power device as the testing target for atomic layer etching process. The functional-etching verifications of the plasma-enhanced atomic layer etching system and software/hardware modifications are based on the GaN power device testing results.

System specifications :

- 12 inch 晶圓製程 12 inch wafer fabrication process
- ICP 脈衝電漿 ICP pulsed RF generator：0-3000W(13.56 MHz); 1kHz pulse frequency
- 基板電極 Substrate RF generator：0.1~300W(13.56 MHz)
- 高頻製程氣體切換 High switching frequency for processing-gases
- 中性束模組 Neutral beam module

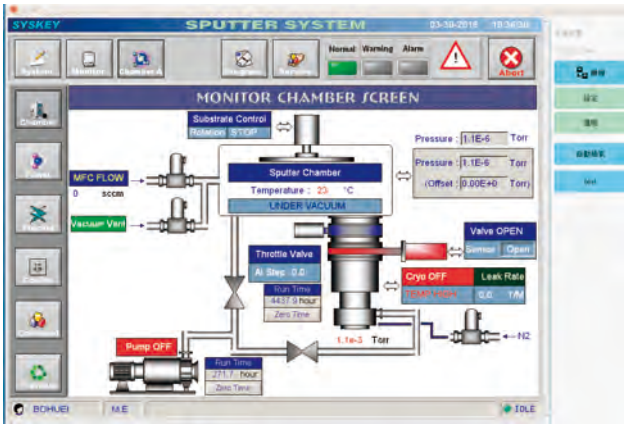
12 吋原子層蝕刻系統
12-inch Atomic Layer Etching (ALE) System

濺鍍系統之遠端監控製鍍軟體

Remote Deposition Monitoring Software of Sputtering System

針對工廠老舊電腦設備無法更新或維護軟硬體的部分，設計以遠端控制方式，發送執行命令或觀察設備執行情況，維持設備的運作。例如，螢幕輸出線因不明原因訊號衰減，使得顯示畫面產生色偏或錯位，造成操作人員困擾，而電腦又無法安裝虛擬機器，或因帳號問題無法使用遠端桌面，此時就可以採用濺鍍系統之遠端監控製鍍軟體，重新取得電腦畫面讓使用者操作。

As for the old computers and equipment in the factory which cannot be upgraded, or the hardware/software cannot be maintained, there is the design of remote control approach to send execution command or observe the equipment execution situation in order to maintain the equipment operation. For example, the signal of screen output cable is attenuated due to unknown reason, thus resulting in color shift or misalignment of display screen bothering the operators. And the virtual machine cannot be installed in the computer, or the remote desktop cannot be launched due to the account problem. This is when the remote deposition monitoring software of sputtering system can be used to regain the access to the computer screen to be operated by the user.



System specifications :

- 作業系統支援 Supported operating systems：Windows XP/7，Linux
- 軟體架構 Software architecture：Java8

浮空投影技術結合藝術創作，於故宮「竹狐絮語」、科技部「未來科技展」活動中展出，成功實現人文科技跨域整合

The Integration of Floating Image Projection and Artistic Creation Was Exhibited in “Techathon—NPM x NCTU New Media Art Exhibition” in National Palace Museum and “Future Tech Expo, FUTEX 2018” of Ministry of Science and Technology as the Successful Realization of Cross-Field Integration of Culture and Technology.

儀科中心開發一創新浮空投影展示櫃，可將虛擬影像投射於空氣中，使虛擬影像與真實物件可共存於真實物理世界之中，實現裸視虛實混合之目的。該系統成像訊號由光源發射後於浮動玻璃交互反射，再將所有光線集中在空氣中，構建出浮動圖像。本技術結合交通大學藝術創作於「竹狐絮語－故宮 x 交大」、及科技部「未來科技展」活動中展出。

TIRI developed an innovative floating image projection exhibition cabinet which can project virtual image in the physical world. If audiences touch the virtual image projected in the air, their hand will pass through it. The system composes of an image source, polarizer and a floating glass with precision structure. The working principle is that the imaging information is emitted by a source and reflected twice inside the floating glass. Finally, all rays concentrate on the air and construct a floating image. This technology was integrated with the artistic creation by NCTU and exhibited in “Techathon—NPM x NCTU New Media Art Exhibition” and “Future Tech Expo, FUTEX 2018” of Ministry of Science and Technology.

System specifications :

- 解析度 Resolution：2732 x 2048 pixels
- 像素密度 Pixel density ≥ 250 ppi
- 影像格率 Image frame rate ≥ 120 Hz
- 影像大小 Image size：300 x 300 mm^2

右圖：結合交大藝術創作於交大展出
左圖：獲選「未來科技展」最佳人氣技術獎
Right：Techathon—NPM x NCTU New Media Art Exhibition;
Left：it was awarded the “Most Popular Technology” in “Future Tech Expo, FUTEX 2018”.

研發「分件組裝零件自動檢測系統」解決航太產業組裝零件檢測需求

Development of “Automatic Inspection System for Spare Parts” to Meet the Demand for Inspection of Assembly Parts of Aerospace Industry

飛機發動機、汽車引擎或配線等各種零配件組裝場合，其機械組件生產除了複雜且精確的車銑加工之外，組件上常依客戶要求裝設諸多組裝零件，因此組裝零件可能存在不良品或工作人員漏裝、錯裝、組裝不良、漏檢等狀況，為確保每個機械組件生產無誤，引進自動光學檢測技術，利用機器視覺影像辨識來替代人眼檢測，並結合多軸電控平台開發『分件組裝零件自動檢測系統』，協助廠商達到自動化檢測。檢測結果亦可儲存為品保資料待查，作為未來生產大數據分析，以利後續改善生產流程與製程。

In various parts assembly occasions such as the manufacturing of aircraft engine, automobile engine, or wiring, the production of mechanical parts requires complicated and precise milling and machining, and there are many assembly parts to be installed as requested by customers. Therefore, there could be problems of these assembly, such as defective spare parts, miss or poor installation by workers, or mistake of finished product inspection. To ensure the proper production of every mechanical part, the automatic optical inspection technology has been introduced to replace human eye inspection with machine vision identification. And it was integrated with multi-axis electronic control platform to develop the “Automatic Inspection System for Spare Parts” to help manufacturer achieve automated inspection. The inspection results can be saved as the quality assurance data for future reference, and they can be used for Big Data analysis for future production in order to facilitate the subsequent improvement of production process flow.

System specifications :

- 量測範圍 Measurement range ≤ Φ 1500 mm
- 工件重量 Work piece weigh < 200 kg
- 偏心調整量 Eccentric adjustment range：maximum 100 mm
- 檢測項目 Inspection items：銷 Pins、螺栓 bolts、護套 sheaths 等零配件

任務導向研發

Mission-oriented Research

Taiwan Instrument Research Institute

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

Promotion of Forward-Looking Fundamental Construction – “Advanced Research Instrumentation Development Service Platform” Project

儀科中心憑藉著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，逐步協助提昇此自研自製之封裝用曝光設備至具產業價值，並以前瞻半導體製程技術逐步協助原子層蝕刻設備技術升級，以期未來輔導國內產業可以交付之先進封裝製程用之半導體曝光機。

2018 年主要成果如下：

- 完成 5 μm 曝光機智慧化 UV-LED 光源之開發。
- 完成曝光機投影鏡頭之組裝與測試，並成功驗證可達線寬 5 um/ 線距 10 um 之曝光投影效能
- 以曝光機方式進行晶圓邊緣圖案化，並以蝕刻方式進行邊緣導溝以有效解決邊緣裂化問題。
- 分別與中央大學、交通大學、長庚大學等三個研究團隊，建立關鍵技術研究團隊，優先培養步進式曝光機鏡頭設計製作與鏡片品質量測團隊，以提升我國自主設計高精度曝光機鏡頭機構之能力與大口徑球面、非球面鏡片品質檢測之能力。研發團隊同時研發 GaN 常關型 (E-mode) 元件製程技術暨高功率元件模組，以建立我國半導體產業自製設備能力重要關鍵。

Relying on years of research and production of optoelectronic instruments and experience in optical system integration, TIRI participated in the integration project of “Advanced Research Instrumentation Development Service Platform” of Forward-Looking Fundamental Construction Project. It is mainly for establishing Taiwan’s capability of self-production of semiconductor process high-end packaging instrument and equipment, and gradually enhancing this self-developed packaging stepper equipment to the level of industrial value. The technical of atomic layer etching equipment can be upgraded by forward-looking semiconductor process technology, such that in the future we can help domestic industry to deliver the semiconductor stepper equipment for advanced packaging process.

The main achievements in 2018 are as shown below:

- Completing the development of intelligent UV-LED light source of 5 μm stepper equipment.
- Completing the assembly and test of stepper projection lens, and successfully verifying the projection performance of line width of 5um/line pitch of 10um.
- Conducting wafer edge patterning via stepper equipment, and effectively solving the edge cracking issue by edge grooving via etching.
- Establishing key technology research teams with the three research teams from NCU, NCTU, and CGU to develop a team for design and fabrication of stepper equipment and lens quality measurement in order to enhance the capability of self-design of high precision stepper lens mechanism and quality inspection of large caliber spherical and aspherical surface in our country. The R&D team also developed GaN (E-mode) device process technology and high power device module to establish the key element of capability of equipment for self-production of semiconductor industry in our country.

生醫科技研發與驗證服務

Biomedical Technology Research and Certification Services

儀科中心運用自身核心能力與研發能量整合學術研究資源，投入生醫科技研發與驗證計畫，期望藉由臨床、學術、產業整合平台的建立，加速研究成果之轉譯與加值，扶植我國生醫產業成長與茁壯。

本年度主要成果如下：

- 建置完成符合國際標準 ISO13485:2016 積層製造服務平台，並獲得核發正式證書，創下國內器材相關之國法人首例通過驗證之積層製造服務平台，提供外界滿足安全、品質，且符合國際標準之客製化 3D 列印產品。
- 累計輔導 8 家廠商申請醫療際系統認證及產品上市許可，協助廠商取得 3 件 ISO13485 證書、1 件 ISO9001 證書、1 件台灣 TFDA GMP 證書、1 件台灣 TFDA 查驗登記、1 件歐盟 MDD 上市許可、1 件美國 FDA 510(k)。其中，台灣微動的磨牙機已取得 ISO 13485:2016 品質認證、歐盟 CE Mark 上市許可，及美國 FDA 510(k) 上市許可，是通過國際市場三項審核最快的台灣廠商；並獲得北美知名廠商 AG Neovo Dental 採購訂單，挺進北美市場。
- 通過 TAF 3291 認證實驗室年度監督評鑑、ISO 7206-4「人工髖關節股骨柄元件疲勞測試」增列評鑑認證，及體外診斷產品 IEC 61010-1 UL WTDP 認證。

TIRI has utilized our core capability and R&D energy to integrate academic research resources to be dedicated to the biomedical technology R&D and verification project. The expectation is to have the establishment of clinic, academic, and industrial integration platform, speeding up the interpretation, value addition, and growth of biomedical industry in our country.

The main achievements this year include:

- Completing the establishment of lamination fabrication service platform meeting the international standard of ISO13485:2016 with official certificate. It is the first time that a domestic instrument related corporation has its lamination fabrication service platform verified to provide customized 3D printing products meeting safety, quality, and international standards.
- Having helped 8 companies to apply for medical system certificate and marketing authorization, and to acquire three ISO13485 certificate, one ISO9001 certificate, one TFDAGMP certificate, one TFDA inspection registration, one EU MDD marketing authorization, and one US FDA510(k). Among them, the tooth grinder of MICROP has acquired ISO13485:2016 quality certificate, EU CE Mark marketing authorization, and US FDA510(k) marketing authorization, making it the Taiwanese company with the quickest approval by these three international market reviews; it also secured the purchase order from the well-known North American company AG Neovo Dental to set foot in the market of North America.
- Being qualified by TAF3291 Annual Supervision Evaluation, additional certificate of ISO7206-4 “Implants for surgery - Partial and total hip joint prostheses -- Part 4: Determination of endurance properties and performance of stemmed femoral components”, and in vitro diagnostic product IEC61010-1ULWTDP certificate.

推動智慧製造關鍵技術之前瞻科技發展與應用計畫

Promotion of Smart Manufacturing Core Technology-Advanced Technology Development and Application Project

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，以國研院暨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，提供傳統製造連貫製程與異質系統整合之情境示範，同時可做為學界智能化模組技術研發成果導入業界前之驗證測試驗證場域，大幅縮短學產界各研究群在技術整合時程，提高國內產業生產力的競爭優勢。

This project is based on the cooperation among academia and research institutes for development of IoT sensors and smart machinery. With the existing laboratories of NARLabs serving as the production sites, the smart fabrication network and data acquisition technology have been introduced together with the heterogeneous information system to integrate the fabrication history and statistics of personnel, materials, environment, and process of precision optics fabrication. Meanwhile, it can also serve as the test and verification site before the academic R&D results of smart modularization technology can be introduced to the industry, which can greatly shorten the time of technology integration from various academic and industrial research groups and enhance the competitive edge of domestic industry.

國際合作

International Cooperation

Taiwan Instrument Research Institute

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

儀科中心與下列國際單位簽訂合作備忘錄：

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
- 義大利薩尼奧大學
  Università degli Studi del Sannio, Italy
- 優力國際安全認證有限公司
  Underwriters Laboratories
- 捷克科學院物理研究所
  Institute of Physics, Academy of Sciences, 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

儀科中心團隊與國內學研界專家組成 IMS 臺北支會代表團參加 2018 年 I2MTC 國際研討會
Delegation of TIRI and professors attended I2MTC 2018.

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

儀科中心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。中心所參與的國際組織茲列舉如下：

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：

- American Society of Mechanical Engineers (ASME) Taiwan Section
- IEEE Instrumentation and Measurement Society (IMS) Taipei Chapter
- American Vacuum Society (AVS) Taiwan Chapter
- Society for Experimental Mechanics (SEM)

國際研究合作案
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初期合作，奠定未來正式合作之基礎，合作進度及效益整理如下表所列。

TIRI is conducting preliminary-stage commissioned projects and joint research with international academic and research units, and expects to establish a foundation for formal cooperation in the future. The following is a progress 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	三維超穎材料開發 Development of Three Dimensional Metamaterials	2014—2018
捷克科學院物理研究所 Institute of Physics, Academy of Science (IoP, ASCR)	(1) ALD 奈米疊層技術製備用於 NiTi 支架之高抗斷裂性 TiO2/Pt 保護膜 Fracture-resistant TiO2/Pt composite protective coating on NiTi stent by ALD nanolamination (2) 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 TiO2 and Al2O3 coatings on NiTi alloy	2014—2018
南非共和國納爾遜曼德拉都市大學 Nelson Mandela Metropolitan University, Republic of South Africa	適用於非洲與亞洲人之隱形眼鏡超精密加工技術 Contact lens ultra precision machining technology applicable for Africans and Asians	2016—2018
優力國際安全認證有限公司 Underwriters Laboratories	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	感測器資訊轉換器原型開發 Development of Analog-to-Information Converter (AIC) Prototype Board	2017—2018
新加坡增材製造創新中心 National Additive Manufacturing Innovation Cluster (NAMIC)	生醫應用與積層製造技術發展 Biomedical Applications and Additive Manufacturing Technology	2018—2020
比利時微電子研究中心 Interuniversity MicroElectronics Center (imec)	先進影像與光學應用技術 Advanced Imaging and Optics Applications	2014—2020

技術服務

Technical Services

Taiwan Instrument Research Institute

儀器系統開發與關鍵元組件委製服務
Instrument and Key Component Manufacturing Services

儀科中心秉持支援學術研究、服務產業界宗旨，提供真空、光學、電子相關儀器及關鍵零組件之委製、校測等技術服務，2018 年提供產學研各界檢測與委製服務累計共 2,003 件。

除了自主儀器技術的開發，國研院儀科中心也接受各界委託，運用儀器科技協助進行前瞻研究並解決問題。2018 年接受外界委託建置開發的儀器系統眾多，僅列舉部分於下表。

In compliance with our goal of supporting academic research and serving industry professionals, TIRI provides OEM and calibration services for vacuum, optical, and electronic instruments and key components. In 2018 we provided a total of 2,003 testing and OEM services to academic institutes, research centers, and companies.

Not only have we constantly developed our own instrumentation technologies, but TIRI is commissioned by various industries to conduct foresight research and solve problems with our advantages in the field. In 2018, we developed a lot of commissioned instrument systems, some of whom are listed below.

儀器系統名稱 Name of Instrument System	合作產業類別 / 單位 Type of Industry/Unit of Cooperation
1 吋電漿輔助原子層沉積系統 1” plasma enhance atomic layer deposition system	半導體製造業 Semiconductor fabrication industry
智慧影像生醫檢測系統 Intelligent biomedical measurement System	醫療院所 Medical institution
線上光學檢測系統 Inline optical test system	精密機械業 Precision machinery industry
UV 波段雙向遠心曝光投影鏡頭 UV bi-telecentric Lens	成功大學 NCKU
ALD 製程驗證平台 ALD Researching and Service Platform	供台灣大學、清華大學、交通大學等 8 校共計 12 個研究團隊使用平台製程 12 research teams from 8 schools (such as NTU, NTHU, NCTU, and so on) are in the service platform.
可攜式小型光譜儀 Portable miniature spectrometer	交通大學、中央研究院、金屬中心 NCTU, Academia Sinica, MIRDC
IOT 電阻式感測訊號處理模組 Signal Processing Module for Resistive Sensor	清華大學 NTHU

委託研究計畫
Commissioned Research Project

(1) 學界委託計畫 Academia Contract Projects

支援學術研究，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。2018 年學界合約案件數眾多，僅列舉部分於下表。

Supporting academic research, promoting national technology development, and conducting long-term R&D cooperation with domestic universities have made TIRI the best ally and driving force for academia in Taiwan. There were a lot of contracted projects for academia in 2018, only some of whom are listed below.

委託計畫 Contract Projects	合作對象 Partner
發展近紅外螢光數位影像相關法系統與技術 — 用於活體軟組織 / 器官力學特性量測 Development of system and technology of near infrared fluorescence digital image correlation method – for characteristics measurement of living soft tissue/organ mechanics	國立臺灣大學 NTU
衛星軌道之微重力與地面重力對離軸光學望遠鏡之影響研究 Study on the influence of microgravity of satellite orbit and ground gravity on off-axis optical telescope	國立成功大學 NCKU
白光共軛焦超光譜影像技術開發及其 1D/2D/3D 之應用研究 Development of white light conjugated focus hyperspectral image technology and research of its 1D/2D/3D applications	國立交通大學 NCTU
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 NTHU
電腦自動亂針繡之降色、選色與佈線研究 Research on color reduction, color selection and wiring of computer automatic needle stitching	國立台灣科技大學 NTUST

(2) 產業界委託計畫 Industry Contract Projects

儀科中心擴散研發能量，鼓勵中心研發團隊結合產業界需求，透過與企業界產學合作方式，培植國內產業界的研發實力，增加產品的附加價值，促使國家產業技術升級。2018 年產界合約案件數眾多，僅列舉部分於下表。

Aiming to diffuse our R&D influence, TIRI encourages our R&D teams to respond to the industrial demands and cultivate R&D capability of domestic industry through academia-industry cooperation. We have been dedicated to increasing the added values of products and the upgrade of national industrial technologies. There were a lot of industry contracted projects in 2018, only some of whom are listed below.

委託計畫 Contract Projects	合作產業類別 Type of Industry
感測晶片封裝製程輔導 Counseling of sensor chip packaging process	電子零件產業 Electronic component industry
CIGS 太陽能製程 P3 鍍膜板材線上 AOI 系統開發計畫 Development project of AOI system for inline inspection of CIGS solar panel	機械製造業 Machine manufacturing industry
高精度扭力調變型電動工具技術開發 – 第二期計畫：工程樣品商品化 Technology development of high precision torque modulation power tool–Phase 2 project: commercialization of engineering sample	電子零組件相關業 Electronic component industry
4 吋原子層沉積系統委製案 4” atomic layer deposition system OEM project	半導體產業 Semiconductor industry
分件組裝零件自動檢測系統 Automatic inspection system for spare parts	航空研發製造業 Aviation research and manufacturing industry

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如下表所列。

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 below.

實驗室名稱 Lab	認可項目 Certification item		驗證範圍 Certification scope	最小不確定度 Smallest Uncertainty
台灣儀器科技研究中心真空標準實驗室 (認證編號：0081) TIRI Vacuum Standards Lab (Lab No.: 0081)	KA2014	線距標準件 Pitch standard	100 nm	4.2 nm
			> 100 nm to 200 nm	5.6 nm
			> 200 nm to 500 nm	12 nm
			> 500 nm to 1000 nm	24 nm
			> 1000 nm to 2000 nm	46 nm
	KA2014	線距標準件 Pitch standard	(100 to 10,000) nm	0.01×P (P in nm)
	KD2002	離子式真空計 Ionization vacuum gauge	1.0 E-05 Pa to 5.0 E-02 Pa	0.064P (P in Pa)
	KD2003	電容式真空計 Capacitance diaphragm vacuum gauge	1.0 E-01 Pa to 5.3 E-01 Pa	0.048P (P in Pa)
			>5.3E-01 Pa to 9.0E+04 Pa	0.020P (P in Pa)
	KD2006	真空計 Vacuum Gauge	1.0 E-1 Pa to 5.3 E-01 Pa	0.18P (P in Pa)
			>5.3E-01 Pa to 9.0 E+04 Pa	0.061P (P in Pa)
台灣儀器科技研究中心光電檢校實驗室 (認證編號：1529) TIRI Optoelectronic Calibration Lab (Lab No.: 1529)	KG3027	光澤板 Gloss standard plate	(70 to 100) GU (20°)	0.80 GU
			(81 to 100) GU (60°)	0.76 GU
			(98 to 100) GU (85°)	0.87 GU
台灣儀器科技研究中心光電檢校實驗室 (認證編號：2340) TIRI Optoelectronic Calibration Lab (Lab No.: 2340)	O996	曲率半徑 Radius of curvature	convex curvature：≧ 5 mm concave curvature：≧ 6 mm	
	O005	折射率 Refractive index	1.3000 nD to 1.7200 nD	
台灣儀器科技研究中心生醫平台實驗室 (認證編號：3291) TIRI Biomedical Platform Lab (Lab No.: 3291)	E001	電子醫療器材 (共 19 項) Electronics Medical Device (total of 19 items)	IEC 60601-1 醫療電子設備 - 第 1 部分：基本安全和基本性能的一般要求 IEC 60601-1 Medical electrical equipment — Part 1: General requirements for basic safety and essential performance	

實驗室名稱 Lab	認可項目 Certification item		驗證範圍 Certification scope	最小不確定度 Smallest Uncertainty
台灣儀器科技研究中心生醫平台實驗室 **(認證編號：3291)** TIRI Biomedical Platform Lab (Lab No.: 3291)	E001	電子醫療器材 (共 19 項) Electronics Medical Device (total of 19 items)	01. 功率測試 Power Input Test 02. 濕度前置處理測試 Humidity reconditioning Treatment 03. 標示辨識 Legibility of Markings 04. 標示耐磨耗測試 Durability of Marking Test 05. 低電壓測試 Low Voltage Reliability 06. 電壓、電流極限測試 Voltage or Charge Limitation 07. 工作電壓量測 Working Voltage Measurement 08. 絕緣耐壓測試 Dielectric Voltage Withstand 09. 球壓測試 Ball Pressure 10. 設備穩固性與運輸性 Stability and Transportability 11. 把手負荷測試 Handle Loading Test 12. 溫度測試 Temperature Test 13. 電源供應器斷電測試 Interruption of Power Supply 14. 錯誤操作與單一失效測試 Abnormal Operation and Single Fault Conditions 15. 外殼機械強度測試 Enclosure Mechanical Strength 16. 跌落測試 Drop Test 17. 模壓釋放測試 Mold Stress Relief Test 18. 電池反接測試與過度充電測試 Reversed Battery Connection / Overcharging 19. 洩漏電流測試 Leakage Current Test	
	M005	彎曲測試 Bending test	ASTM F382 金屬骨板彎曲特性的測試方法與標準規範 限平骨板 ASTM F382 Standard Specification and Test Method for Metallic Bone Plates Flat bone plates only	
	M006	疲勞測試 Fatique Test	非模組化人工髖關節股骨柄元件 Non-modular Stem ISO7206-4「人工髖關節植入物和股骨柄元件的耐久性和疲勞測試」 ISO7206-4 Implants for surgery — Partial and total hip joint prostheses — Part 4: Determination of endurance properties and performance of stemmed femoral components 頻率 Frequence ≦ 30 Hz 力量 Load： (0.1 to 7.5) kN, 壓縮 Compression	

人才培育
Talent cultivation

儀科中心透過開辦各種研習班與研討會，為國內學術界培育優秀專業人才，並培育高科技產業所需研究人力，以提升國家科研基礎人才的質與量。2018 年舉辦的研習班與研討會多達 62 場。包括「Fourier Optics 光電專班」、「光學元件設計、製作與檢測技術研習班」、「儀器技術訓練課程」、「2018 原子層沉積技術發展與產業應用研討會」等，及醫材創新輔導方面課程，如「醫療器材產品市場分析實務暨營運規劃訓練營」、「人工智慧及數位醫療法規趨勢研討會」、「2018 創新醫電與醫學影像國際商機論壇與媒合會」。

TIRI has cultivated outstanding professional talents for domestic academia via various workshops and seminars, and cultivated research manpower required by high-tech industry in order to enhance the quality and quantity of talents as the foundation for scientific research of our country. There were as many as 62 workshops and seminars organized in 2018, including “Fourier Optics Class”, “Workshop of Design, Fabrication, and Inspection Technology of Optical Device”, “Instrument Technology Training Course”, and “2018 Atomic Layer Deposition Technology Development and Industrial Application Seminar”. And there were courses related to counseling of innovation of medical instrument, such as “Training Camp for Medical Devices Market Analysis Practice and Operational Planning”, “AI and Digital Medical Device Medical Device Regulations Trend Seminar”, and “2018 Global Opportunities and Partnering Event for Innovative Medical Electronics and Medical Imaging”.

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