



ITRI Captures Three 2022 R&D 100 Awards

ITRI won three 2022 R&D 100 Awards with its High Resolution Full-Color Micro LED Display for AR Glasses; Point-of-Care AI-DR; and, in collaboration with Celanese® Micromax™, GreenTape™ 9KC LTCC and Ag Metallization for mmWave 5G Wireless Devices. The ITRI team accepted the honors at the award gala held in San Diego, CA on November 17.

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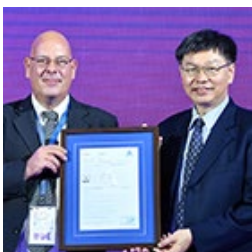
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» Feature



ITRI Wins Three 2022 R&D 100 Awards



Representatives of the three R&D 100 awards winners received the awards at the gala in San Diego on November 17.

The R&D 100 Awards recently announced this year's winners. ITRI won three for its **High Resolution Full-Color Micro LED Display for AR Glasses; Point-of-Care AI-DR;** and, in collaboration with Celanese® Micromax™ (former DuPont MCM), **GreenTape™ 9KC LTCC and Ag Metallization for mmWave 5G Wireless Devices.** Winners accepted the awards in the gala held in San Diego on November 17.

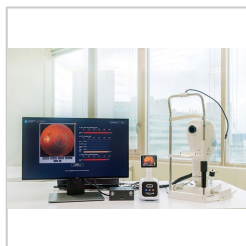
According to the program organizer R&D World, the 100 winning products and technologies are the disruptors that will change industries and make the world a better place. "ITRI has had an amazing 15-year run at the R&D 100 Awards. This year included three winners and seven finalists, so 10 ITRI technologies received acknowledgement this year," said R&D World VP and Editorial Director Paul Heney. "Over the past several decades, Taiwan has been an economic phenomenon, and one of the reasons is that Taiwan has consistently invested in research and development. National labs like ITRI are critical for innovation and the

development of new technologies for industry,” he added.

ITRI President Edwin Liu expressed his excitement about ITRI's performance at the R&D 100 Awards. “Many winning technologies have completed field verification, and brought industry and society significant benefits,” he said. “The High Resolution Full-Color Micro LED Display, with ultra-wide color gamut, was developed for AR glasses to accurately address terminal product demands. In cooperation with Celanese® Micromax™, GreenTape™ 9KC LTCC and Ag Metallization technology is developed for mmWave 5G wireless devices, which serves a great boost to 5G O-RAN development. Lastly, the Point-of-Care AI-DR alleviates doctors' burden as it screens for eye lesions rapidly.”



ITRI's High Resolution Full-Color Micro LED Display for AR Glasses has greater performance and high market potential in consumer electronics and automotive curved displays.



ITRI's 2022 R&D 100 Awards Winners

High Resolution Full-Color Micro LED Display for AR Glasses

ITRI's High Resolution Full-Color Micro LED Display for AR Glasses features high resolution, high brightness, great compatibility, and low power consumption. ITRI has also established an alliance to provide comprehensive supply chain solutions. As the micro LED applications in consumer electronics and automotive curved displays are growing, this innovation helps panel manufacturers grasp more global business opportunities.

Point-of-Care AI-DR

[Point-of-Care AI-DR](#) realizes rapid diagnosis of diabetic retinopathy (DR) and diabetic macular edema (DME) in 5-10 seconds. It provides explainable AI by clearly marking lesions and assessing severity levels for fundus images. This innovation assists non-ophthalmologists to determine whether it is necessary to refer patients to eye clinics for further assessment and solves the eye care issue caused by the uneven distribution and lack of ophthalmologists. Applicable for both community and hospital settings, its mobile service increases DR screening rate and the early intervention in urban and remote areas greatly reduces medical costs.

GreenTape™ 9KC LTCC and Ag Metallization for mmWave 5G Wireless Devices

5G mmWave frequency bands have become the key to the next-generation network. ITRI and Celanese® Micromax™ have teamed up to combine [GreenTape™ low-temperature co-fired ceramic \(LTCC\) material](#) and ITRI's mmWave circuit design, creating a 5G mmWave communication component with high commercial value. Featuring low loss, high stability, and high heat dissipation, the innovation can be wielded as a powerful tool for 5G O-RAN players.

In this Issue, we will feature the High Resolution Full-Color Micro LED Display for AR Glasses. Click the next article to learn more.



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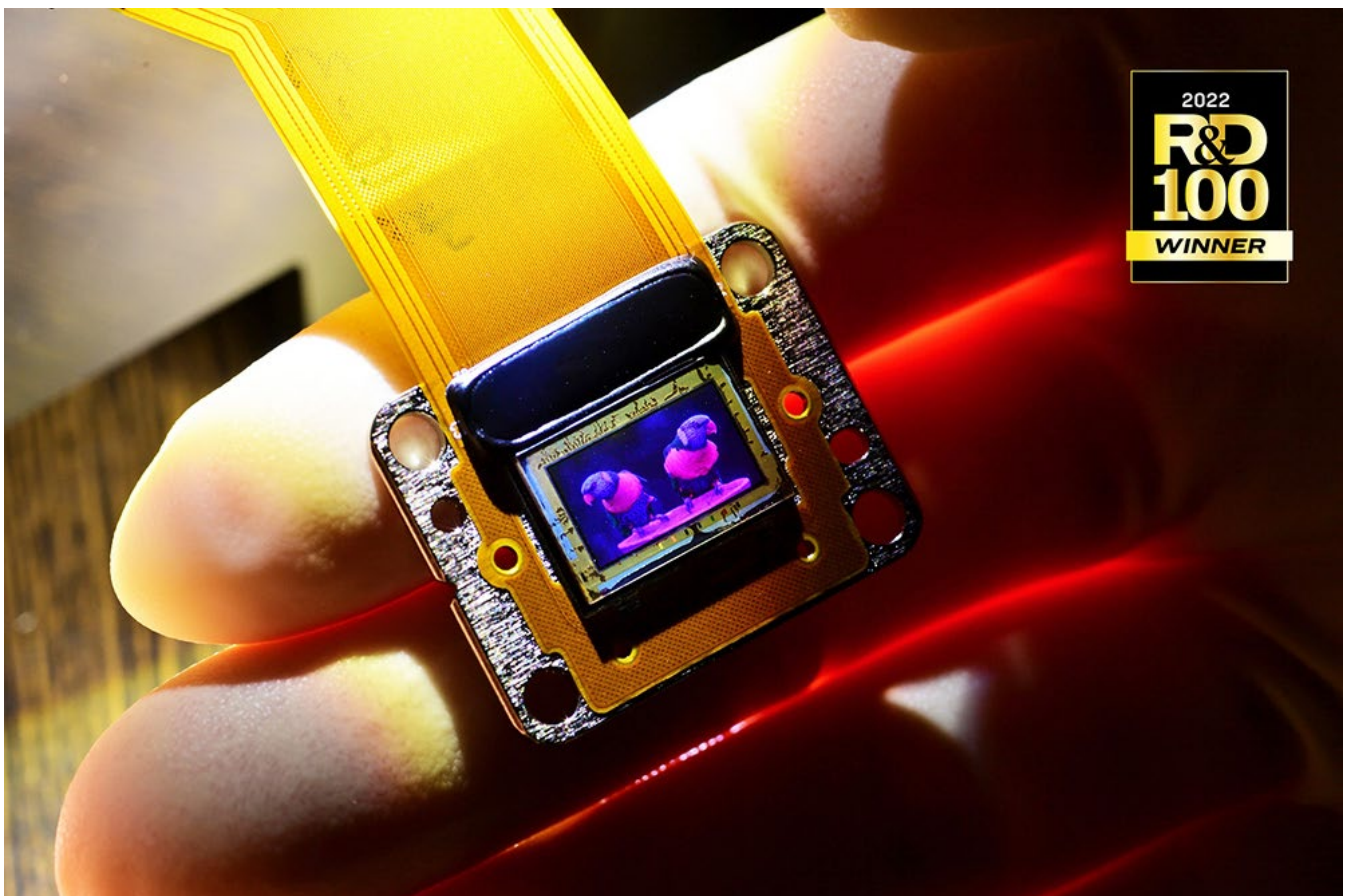
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» Feature

High Resolution Full-Color Micro LED Display for AR Glasses

To drive panel manufacturers and other industry players in meeting demands for immersive AR experiences in the metaverse, ITRI created the High Resolution Full-Color Micro LED Display for AR Glasses. The design adopts heterogeneous integration technology similar to semiconductor processes to create micro-displays with wide color gamut by bringing Micro LED, CMOS, and quantum-dot color conversion layers together within a single panel.



The High Resolution Full-Color Micro LED Display module is suitable for next-generation AR glasses.

This technology is characterized by four key features:

- **High resolution (> 2,000 PPI):** Its ultra-high resolution is ideal for AR applications.
- **High brightness (> 20,000 nits):** The Micro LED display provides 10 times higher

brightness than the smart glasses currently on the market and can thus work in outdoor scenarios. It meets the brightness requirements of the existing plug-in side-projection AR light machines and can potentially surpass the performance of counterpart displays such as OLED-based designs.

- **Great compatibility (< 0.5 inch):** The display and sensor functions are integrated in a compact design, which gives the product a slim look.
- **Low power consumption (< 1 W):** By consuming less than half of the energy of conventional smart glasses, the device can be worn for long hours without recharging.

“ITRI’s High Resolution Full-Color Micro LED Display for AR Glasses has high commercial value and can enhance user experience due to its high resolution, high brightness, device compatibility, compact size, and low power consumption,” said Dr. Shih-Chieh Chang, General Director of ITRI’s Electronic and Optoelectronic System Research Laboratories. “This high resolution Micro LED will help leading global display players to capitalize on the vast range of emerging Micro LED applications. ITRI has assisted manufacturers in pilot production and technology transfers, which have laid the foundation for developing in-vehicle displays and next-gen XR glasses,” he said.



Video of High Resolution Full-Color Micro LED Display for AR Glasses.

The manufacturing process of this technology transforms the current way of making display modules. Different from conventional LED manufacturing processes, the Micro LED display requires a high-efficiency micrometer-grade LED process and heterogeneous bonding technology with high precision and high resolution on active backplane. The overall process requires semiconductor processes such as high-precision photolithography, CMP planarization, plating, and high-precision alignment wafer bonding. Compared to the class 1000 cleanroom process used by conventional LEDs, it needs a class 10 cleanroom for

heterogeneously integrating components.

To introduce ITRI's Micro LED technology into AR applications and deliver it from lab to market, ITRI founded an alliance in 2016 to integrate the industry chain horizontally. The alliance connects about 50 industry chain suppliers in advanced materials, semiconductor processes, and precision equipment. It provides comprehensive upstream-to-downstream solutions to fulfill industry needs for different stages of verification, development, and IP licensing.



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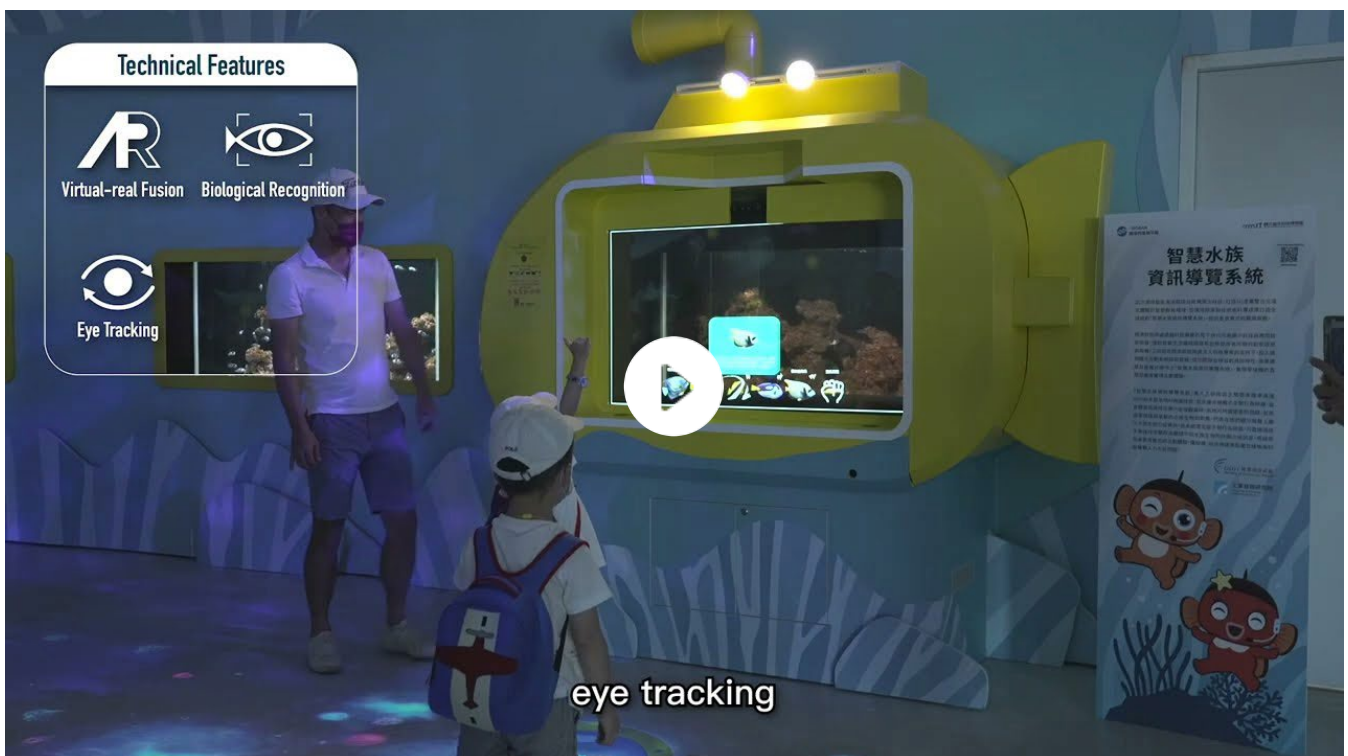
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» Spotlight

ITRI Named a CES 2023 Innovation Awards Honoree



Video of the AI Aquarium.

ITRI has been named one of the CES® 2023 Innovation Awards Honorees for its AI Aquarium, the world's first intelligent aquarium that exhibits marine life information in real time according to visitors' line of sight. This is the 10th award that ITRI has collected from CES since its first participation in 2018. The awarded innovation will be exhibited in early January at ITRI's pavilion at CES 2023, the largest in-person, audited business event to take place in the U.S. since early 2020.



AI Aquarium enables gaze tracking and interactive information display.

The CES Innovation Awards program, held by the Consumer Technology Association (CTA)[®], is an annual competition honoring outstanding design and engineering in 28 consumer technology product categories. Honorees this year including ITRI have shown how technological innovations help address global challenges and improve the lives of people around the world. From a record high number of over 2,100 submissions, ITRI's AI Aquarium was selected as an honoree in the Virtual & Augmented Reality category for its smart design in interactive display technology and the breakthrough it has made in exhibition solutions.



AI Aquarium displays aquatic species information according to visitors' gestures.

AI Aquarium is the world's first intelligent aquarium that uses virtual-real fusion, object recognition, and gaze tracking technologies to exhibit marine life information in real time. With an accuracy of 98%, the system dynamically recognizes and displays aquatic species and their positions. This innovation is also available for gesture control, which can create intuitive but hygienic interaction for visitors via a contact-free method.



AI Aquarium can detect gaze direction regardless of the visitor's height, allowing visitors of all ages to enjoy unique interactions with aquatic species.

ITRI President Edwin Liu commented that AI Aquarium integrates smart display, AI recognition, and human-computer interaction technologies to introduce augmented reality tourism services. “This innovation addresses the needs in the post-pandemic era and the trends of immersive experience,” he said. “It has been applied in the National Museum of Marine Science and Technology in Taiwan to enhance marine exploration and education, offering a more interactive and effective option than conventional aquariums.” Besides edutainment, the technology can also be deployed for other purposes such as surgical simulation for medical training.

Together with eight more of ITRI’s innovations in sports & fitness, AI, robotics, and ICT, the AI aquarium will be exhibited at CES 2023 in Booth 9855, North Hall, LVCC, Las Vegas from January 5 to 8. Visitors are welcome to explore these innovations and discover new opportunities. Online exhibition is also available here: <https://event.itri.org/ces2023>.



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» R&D Focus



Circular Economy in Garment and Footwear



ITRI introduces sustainable solutions to reduce garment and footwear waste.

How devastatingly fast fashion impacts our planet is no news. According to Earth.Org, the colossal amount of global textile waste is equivalent to having a rubbish truck full of clothes end up on landfill sites every second. In the time you spent reading just that sentence, another 15 tons of clothes were buried.

The footwear industry also contributes a fair share of fast-fashion waste. According to Quantis, an environmental sustainability consultancy, the footwear industry is responsible for 1.4% of global greenhouse gas emissions, of which 60% stems from manufacturing and obtaining raw materials for shoes.

The garment and footwear industries are each dealing with different challenges in their pursuit of circular economy. To realize fiber-to-fiber recycling, the garment industry is striving to sort

blended fibers. Footwear manufacturers, on the other hand, are keen to realize a closed recycling loop for shoes due to unrecyclable materials and heterogeneous component integration.

One man's trash, as the proverb has it, is another man's treasure. Click below to learn how ITRI's cutting-edge solutions have turned waste into valuables.

[Alchemy for Textile Industry: Sort to Save the World](#)



[Move Towards Net Zero With Your Feet](#)



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» R&D Focus

The Alchemy for Textile Industry

Automated Textile Sorter

A total of 206 brands worldwide, including H&M and PUMA, have promised to increase by 25% their usage of recycled polyester (rPET) by 2025, and to use 100% recycled or other sustainable textile products before 2030. However, the major challenge lies in the source of rPET, a new gold that the textile industry is pursuing.

While rPET coming from recycled plastic bottles is rather limited and producing rPET from textile products is difficult and expensive, ITRI's smart sorting system acts as an alchemist to produce this gold and help textile manufacturers fulfill their promises.

ITRI researchers found that existing clothes sorting systems have been struggling with textile blends and the PET therein cannot be easily sorted from other fibers. Moreover, any sorting accuracy below 90% is not conducive to textile factory systems.



Integrated with a conveyor belt, ITRI's sorting solution has a throughput of one article of clothing per second.

To recover higher-purity PET from textile blends, ITRI created an automated textile sorting system that can identify and separate textile blends based on optical analysis of fabric compositions. Besides its ultra-high sorting speed of one article of clothing per second, it has a pioneering accuracy in identifying post-consumer textiles of over 96%. Integrated with an industrial conveyor belt, this system can achieve a throughput of 900 kg of textiles per hour, regardless of color, material, and texture.

So how does this technology achieve a high accuracy in sorting textiles? According to Ryan Chu, ITRI's Technical Manager, ITRI integrated near-infrared (NIR) excitation and auto-focus Raman spectrum technology, and trained the AI model with spectral property data of different fabrics. The sorting purity for pure PET reaches more than 99%, and the identification accuracy of PET/cotton blends is above 95%. The sorted PET can then be recovered and processed effectively into rPET. The sorting technology is also capable of sorting PET-based fabrics that contain only a small proportion of other fibers. For example, it can sort PET blends with a minimum content of 5% cotton and PET blends with a minimum content of 1% Lycra. See below for the benchmark chart of ITRI's sorting system.

	Tech Benchmark	ITRI's Sorting Solution
Sortable Fiber	PET, T/C, Nylon, cotton (9 categories in total)	PET, T/C, T/OP, Nylon, cotton (7 categories and counting)
Accuracy (%)	61~98.5% (depending on materials)	> 95% (for T/C)
Sorting Purity for Pure PET	> 82% PET	> 99% PET
Minimum Content of T/C Blend Sortable	> 20% cotton	> 5% cotton
Minimum Content of T/OP Blend Sortable	Unsortable	> 1% elastic fibers
Throughput	900 kg per hour	900 kg per hour

This chart compares ITRI's sorting solution to the technological benchmark in textile identification and separation.

Curious about what happens to the clothes put into the sorting system? When cast onto the moving conveyor (as in a factory), the wrinkly fabric is tracked by a laser profiler, so that the system can receive the best Raman signal regardless of the fabric's topography. After the fabric is hit by 1,064 nm NIR excitation beams, it responds with distinctive peaks, which allows the AI model to analyze the fabric's composition. The fabric is then categorized into, for example, 100% PET, 85% PET/15% cotton blend, or 99% PET/1% Lycra, and sent to different piles with air jets.

Once sorted, these clothes may be converted to reliable inputs for apparel manufacturing industry players to realize the textile-to-textile recycling that was once a castle in the air.



» R&D Focus



Move Towards Net Zero with Your Feet

New Materials to Make Shoes Greener



ITRI's eco-friendly shoe material significantly reduces the carbon emissions of shoe production.

Common plastics used in shoe production such as polyester (PET), thermoplastic polyurethane (TPU), and ethylene-vinyl acetate (EVA) are unrecyclable and responsible for substantial carbon emissions. To phase out these eco-unfriendly shoe materials, ITRI has developed a novel and low-carbon emission material called recycled thermoplastic polyester elastomer (rTPEE-G).

rTPEE-G consists of recycled polyester (rPET) extracted from PET bottle flakes and bio-based diamines. According to Wayne Wu, Technical Manager from ITRI's Material and Chemical Research Laboratories, the new material cuts the carbon emissions of producing a pair of shoes from 13.6 kg CO₂e to < 2 kg CO₂e—a significant 80% decrease from those of

conventional plastic shoes. This provides shoe makers with a promising material solution to meet their carbon reduction goals.

“Besides the low carbon material nature, rTPEE-G has strong properties allowing for more eco-friendly designs of shoe manufacturing, for example, using single material for different shoe parts and reducing the usage of adhesives.”

Wayne Wu, Technical Manager at ITRI

Conventional shoe manufacturers use different materials to produce upper, laces, midsole, and outsole of a shoe and thereby heterogeneous material poses an obstacle to footwear recyclability. rTPEE-G was developed to address this issue. This material alone can be made into these shoe parts to suit their needs without compromising its quality or performance. It acquires properties such as high rebound, high shock absorption, or anti-slip. Such versatility makes it easy to accommodate the designs of functional and comfortable sneakers.



ITRI's rTPEE-G material can be used for different shoe parts.

To avoid using adhesives that hinder shoe dismantling, rTPEE-G enables the midsole and outsole, which account for 60% of a shoe, to be produced as one piece with a foam injection molding technique. As this new structure requires no other materials than rTPEE-G, discarded shoes at the end of their life cycle can be easily sorted and pulverized, and the recovered materials can be reproduced into shoe parts or even new sneakers, realizing the shoe-to-shoe, closed-loop recycling.

As numerous countries are committed to achieving net zero emissions by 2050, influential brands such as Nike and adidas have also been developing products made from recycled materials. By turning the nonrecyclable into recyclable, rTPEE-G gives new hope to the shoe industry by providing a solution that makes shoes more recyclable and more sustainably produced with less waste and a smaller carbon footprint.



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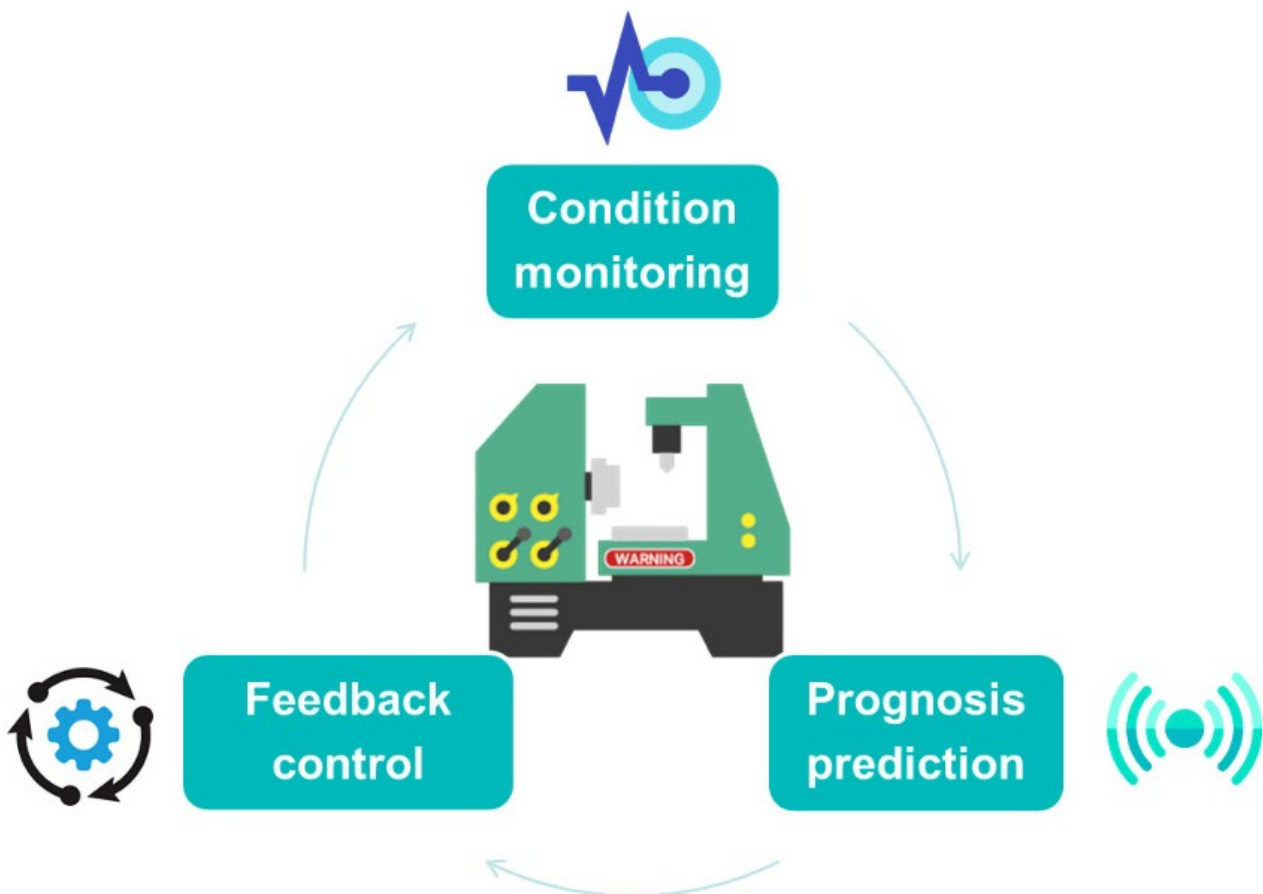
» R&D Focus



Condition Monitoring System for Cutting Tools

Yu-Hung Pai and Hung-Tsai Wu

Cutting tool wear has a direct impact on the manufacturing process and has troubled industries for decades. Users often spend considerable cost and maintenance time due to tool breakage. It is therefore critical to maintain the cutting quality and avoid machine damage from abnormal vibration. However, the current pain point is that manufacturers find it challenging to build the criteria for examining tool health conditions based on audio or visual inspection of the cutting tools during machining. Therefore, the best solution so far is to handle the tools with extra care or conduct a conservative evaluation of the tools' useful life, which leads to additional labor cost, downtime cost, and tool expenses.



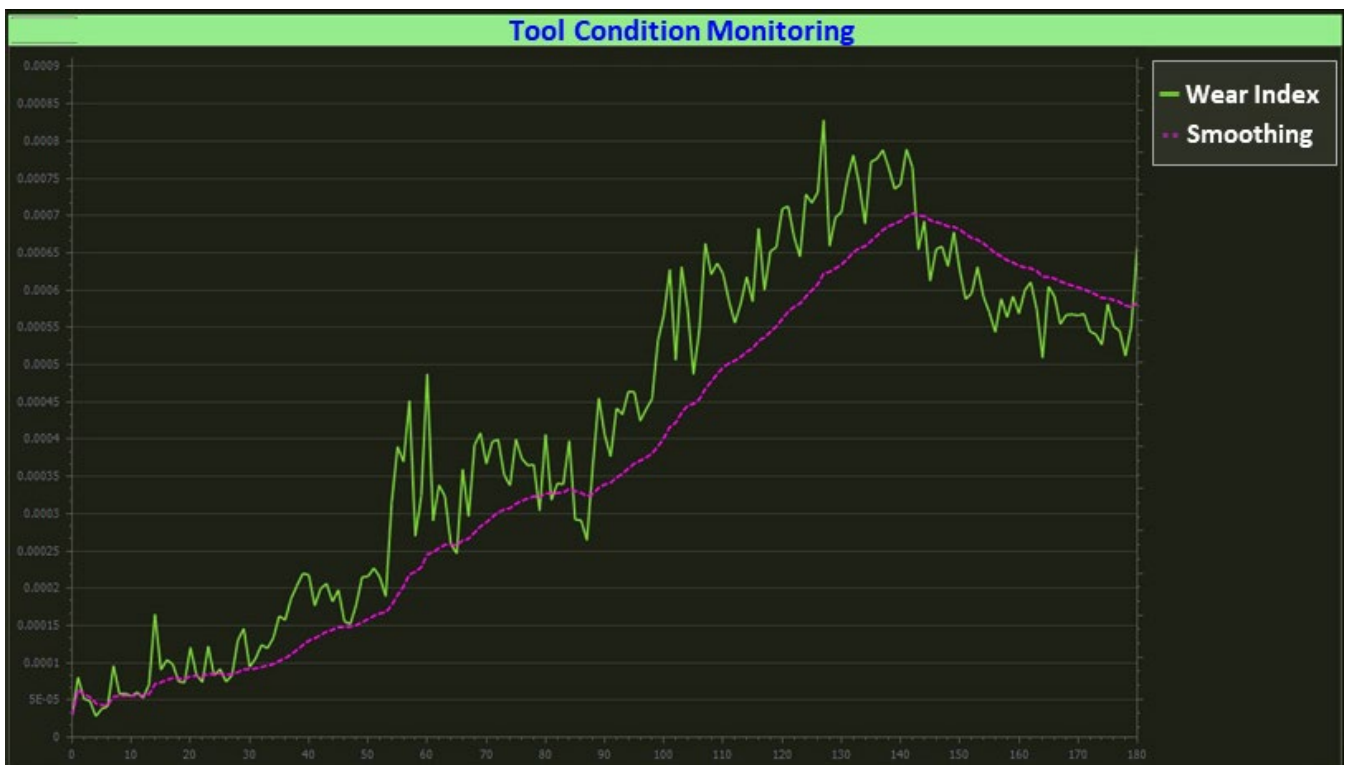
CMSCT monitors tool condition, makes prognosis predictions, and provides feedback control.

To overcome these bottlenecks, ITRI developed the Condition Monitoring System for Cutting

Tools (CMSCT). This system generates precise criteria for tool condition, makes prognosis predictions, and provides feedback control. Since vibration signals are highly sensitive to wear-related features, CMSCT evaluates the tool condition based on three-axial vibration signals coming from machine spindle. The use of vibration signals also allows the evaluation to be made without stopping the process of production, resolving a dilemma of conventional human inspectors. Furthermore, vibration monitoring is a better solution for most equipment, especially for the old equipment with fixed, unadaptable structure, as vibration detection devices have great installation flexibility and minimum system cost.

To synchronize with the machine tool, CMSCT is connected to the machine tool's controller to access real-time parameters including feed rate, cutting speed and spindle load to identify the machining status. It prevents the calculating procedure from being interfered by idle signals, and can halt the equipment when failure occurs. Integrating digital signal processing technologies and AI algorithms, CMSCT leverages adaptive self-training to monitor the life cycle of cutting tools.

To avoid building myriads of AI models for different machining conditions, CMSCT adopts a self-supervised deep learning model, that can distinguish data without labeling needed. The learning model quantifies the current tool condition, generates a wear index, and provides a warning threshold upon tool failure. Once the wear index exceeds the threshold or when other abnormalities are detected, CMSCT autonomously halts the equipment and retracts the tool, protecting both workpieces and equipment from potential damage.



The wear index increases when the tool condition deteriorates.

CMSCT reaches an approximately 90% accuracy in predicting the remaining useful life of a cutting tool for milling and drilling. This system provides customized UI for different

equipment makers and users. CMSCT has already been implemented in five factories in different fields of two enterprises, one of which is a Taiwan-based heavy equipment manufacturer, with proven performance and excellent user feedback. It reduces millions of dollars spent on tool breakage and saves 10% to 20% maintenance time every year.

CMSCT has been granted a patent in Taiwan in 2022. This cost-effective tool can enhance the reliability and the quality of machining processes, assisting industry players to achieve intelligent manufacturing and energy saving.



About the Authors



Yu-Hung Pai is an associate researcher in the Mechanical and Mechatronics Systems Research Laboratories at ITRI. He received his B.S. and M.S. degrees in Civil Engineering from National Cheng Kung University. He specializes in vibro-acoustics, condition monitoring, and data science, focusing on machining processes and railway engineering.



Dr. Hung-Tsai Wu works as a researcher in the Mechanical and Mechatronics Systems Research Laboratories at ITRI. He received his B.S. and Ph.D. degrees in Communications Engineering from National Chiao-Tung University, Taiwan. His research focuses on predictive maintenance of machinery, and he has published over ten technical papers.



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» Collaboration

ITRI and Oxford Instruments Jointly Enhance GaN HEMT Performance

ITRI and Oxford Instruments announced new technology developments that will significantly benefit key hyper-growth electric vehicle, datacenter and 5G markets. A GaN (gallium nitride) HEMT device called GaN MISHEMT was developed, with a new architecture defined by a recessed and insulated gate junction into the AlGaN layer.

The technology allows critical transistor components to operate at higher voltages which increases performance and reliability, while also achieving a safer and more energy efficient (normally off 'E-mode') operation compared to existing devices. Prior to product commercialization, ITRI provided pilot production and value-added services, including manufacturing process verification, product development, and production of semi-finished products. ITRI's integration services have proved incredibly beneficial, especially the GaN development project, which quickly verified the higher performance of GaN MISHEMT and provided a lower risk and faster route to market for the device.



The ALD system of Oxford Instruments is a critical GaN solution that improves surface quality and reduces defect rates (Photo credit: Oxford Instruments).

“The performance benefit of GaN MISHEMT was well established at ITRI. However, the fine profiles required in the device architecture were difficult to create repeatably with the etch equipment available at the time. We were pleased to leverage the high performance of Oxford Instruments’ ALE equipment and immediately saw the benefit for volume manufacturing of our devices,” said ITRI General Director of Electronic and Optoelectronic System Research Laboratories Shih-Chieh Chang.

“We have excellent strategic partners and customers like ITRI, and our GaN solutions are positioned strongly to serve, grow and gain from big opportunity markets. Our leading Atomic Layer Etch (ALE) and Atomic Layer Deposition (ALD) technology is raising material engineering performance to achieve new levels of surface quality and defect reduction, to meet the growing demand for higher performing devices,” commented Klaas Wisniewski, Oxford Instruments Strategic Business Development Director. “With our technology partner ITRI, high volume GaN manufacturing customers and our focused investment into high value and proprietary process solutions, we expect the GaN device market to be a key driver for our business and technology roadmap,” he added.

The outcome of this cooperative research program is expected to make a breakthrough for next-gen compound semiconductors, while benefiting the partners, their regions, and wider global markets.



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» Collaboration



Smart E-Thread™ RFID Technology

A Disruptive Innovation Developed with Primo1D



E-Thread™ contains the world's smallest RFID chip that can be woven into textile products.

RFID tags and labels are commonly used in retail inventory management. However, if tags are lost or removed, it can be difficult to track or log the items. Now with the collaboration between ITRI and the France-based UHF RFID manufacturer Primo1D on the E-Thread™ tag and precision packaging technology, RFID chips are assembled into a size so small that they can be woven into textile fibers, such as clothes and hats, and are durable enough to go through a washing machine.

E-Thread™ is a plastic-free, yarn-shaped RFID tag that can be easily integrated into textile products during the manufacturing process. It is a revolutionary solution for fabric product identification, verification, and tracking for users to manage the entire process from production to delivery and sales.

E-Thread™ contains the world's smallest RFID chip that can be directly embedded into clothing or wearable devices, and it does not require additional power source. ITRI has run a trial production on its advanced packaging platform to achieve heterogeneous integration customized high-mix low-volume manufacturing. Moreover, the data collected by the RFID chips can be permanently stored, tracked, and managed on the cloud.

“For conventional RFID tags, the chip needs to be connected to the encasement to be further connected to external conductors. In contrast, E-Thread™ is based on micro-encapsulation, which allows direct and precise connection between the antenna and the chip. This makes it the first of its kind,” said Shih-Chieh Chang, General Director of ITRI's Electronic and Optoelectronic System Research Laboratories. “The collaboration with Primo1D offers a robust, plastic-free RFID solution for textile product identification, authentication, and tracking,” he added.

Primo1D is currently the only RFID manufacturer on the market who obtained ISO medical certifications. Its Co-founder, Chairman of the Board, and CEO Emmanuel Arène pointed out that since 2004 ITRI has been developing UHF RFID technologies such as the UHF reader, tag antenna, and wide-band antenna. All products are rewritable, encryptable, have a wide data-reading range, and support long-distance communication. By providing digital identities, E-Thread™ makes manufacturing, inventory management, and buying smarter.

Moving forward, ITRI and Primo1D plan to leverage the IoT technology to expand E-Thread™'s applications. Data collected by the RFID chips can thus be stored, managed, and shared. This effort will also upgrade industries' technological competence for smart production and speed up their entry into the global supply chain.



» Activity

Easy-Dismantled Solar Panel Module Certified by TÜV Rheinland

To completely recycle photovoltaic (PV) modules upon decommissioning, ITRI has developed the Easy-dismantled Solar Panel Module with United Renewable Energy (URE), the largest solar panel and solar cell manufacturer in Taiwan, and San Fang Chemical Industry Co, Ltd., a Taiwan-based technological film producer dedicated to sustainable operation. This module meets the IEC international standards and received its first certification granted by TÜV Rheinland for its high safety and reliability.

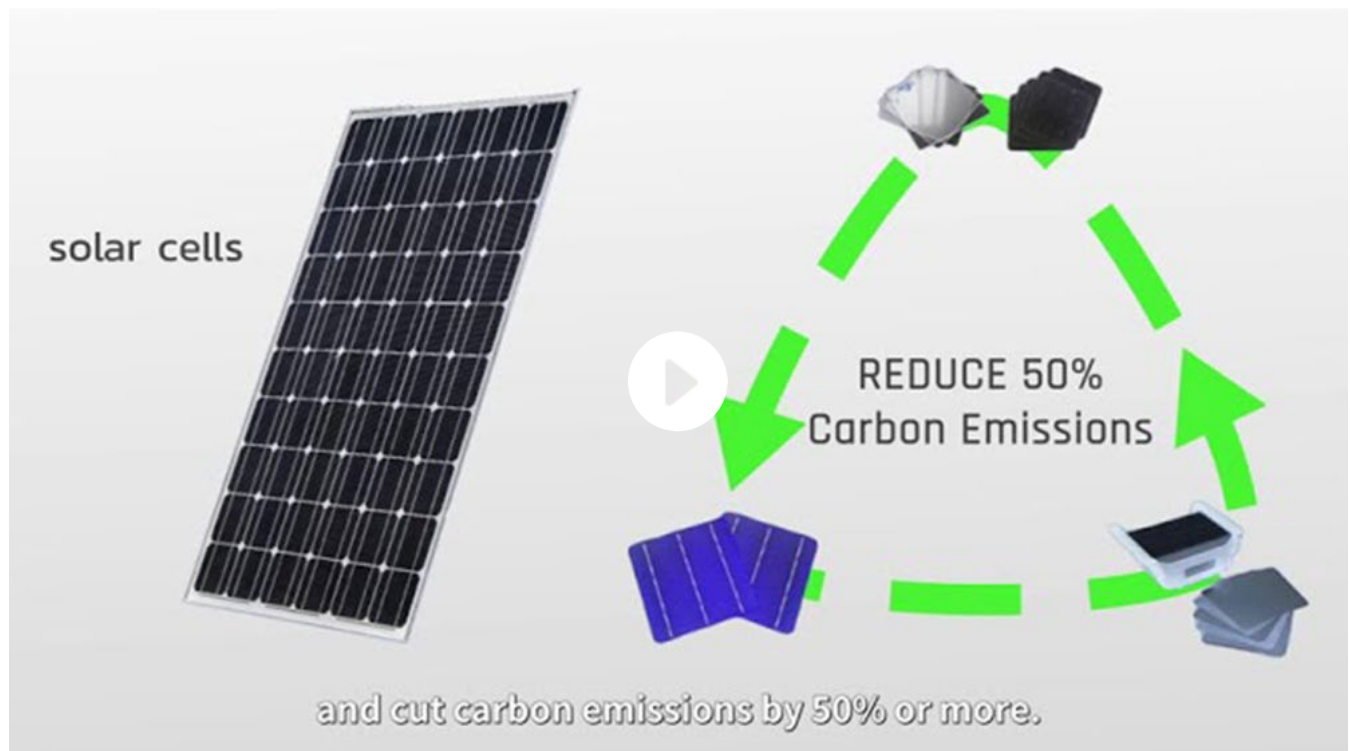


ITRI Executive Vice President Alex Y.M. Peng (right) received the TÜV certification from TÜV Rheinland Expert Michael Kroeger (left).

The module can be fully recycled, and the recovered materials such as silicon and glass can be reused, saving the decommissioned PV modules from being broken up or degraded. ITRI's R&D team estimates that the recycle value of retired PV modules could significantly rise,

roughly from US\$18 million to US\$74 million per 1 GW, creating a new circular economy model for the solar industry.

“ITRI adopts a circular design to reconstruct conventional PV modules,” stated ITRI Executive Vice President Alex Y.M. Peng. The redesign of the module started with a new encapsulant and took into consideration the product life cycle of the backplane, cells, and bracket of a PV module. Dr. Peng stressed that this innovation allows the complete recycling of solar cells and glass plates. The high purity of the recovered silicon wafers greatly increases the material value, reducing the need for new raw materials. With this technology, carbon emissions of PV products are estimated to be reduced by 50% or more. “This can strengthen the competitiveness of the solar energy industry to reach the net zero goals by 2050,” he said.



ITRI's Easy-dismantled Solar Panel Module.

URE Chairman and CSO Dr. Sam Hong said that the latest encapsulation material technology has led to the creation of this easy-dismantled module. It offers the PV industry a ticket to the sustainable circular economy. In addition to tackling the difficulty encountered in recycling, the Easy-dismantled Solar Panel Module also minimizes manpower costs. Supported by MOEA's Department of Industrial Technology, this module design has been tested and proved viable by the Proof of Concept (PoC) conducted by the French Alternative Energies and Atomic Energy Commission (CEA). The material system and structural design of the Easy-dismantled Solar Panel Module have been optimized based on different environmental conditions.

ITRI has been committed to its 2030 Technology Strategy & Roadmap, and the development of green energy technology is an integral part of the Sustainable Environment applications of that initiative. The Easy-dismantled Solar Panel Module has already been tested in Keelung Island, Penghu, and southern France. In addition to passing IEC 61215 and IEC 61730 tests

and receiving TÜV Rheinland's certification, this technology is expected to obtain Taiwan's Voluntary Product Certification (VPC) in the first quarter of 2023.



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» Activity



New ITRI Laureates Receive Honors

The 2022 ITRI Laureate Ceremony was held in November to honor the five newly-minted laureates: Pacific Venture Partners (PVP) Chairman **Paul Por-yuan Wang**, Eternal Materials Director and Senior Consultant **T. F. Shiao**, Delta Electronics Chairman **Yancey Hai**, LCY Group Chairman **Bowei Lee**, and Ruentex Group President **Samuel Yin**.



ITRI held the 2022 ITRI Laureate Ceremony on November 11, 2022 to honor the five new laureates.

Taiwan's President Tsai Ing-wen personally bestowed medals and plaques to these laureates in recognition of their outstanding performances in technology innovation and industrialization. She hopes that their dedication may usher Taiwan to leverage its technological advances and further enhance national industrial competitiveness.

ITRI Chairman Chih-Kung Lee stated that ITRI Laureates have been nominated every year since 2012 in acknowledgement of their contribution to industries and public well-being. The five laureates have been deeply invested in innovative R&D and environmental sustainability, and each represents an important cornerstone in Taiwan's economy.

A special exhibition, “Innovative, Smart, and Sustainable Future,” was organized to showcase ITRI’s latest innovative technologies and services, including the Hydrogen Purification and Distributed Power Generation System, Micro Immersion Cooling Data Center, MetabColor, Carbon Capture and Utilization (CCU): Direct Catalytic Synthesis of Methanol from Carbon Dioxide, and the Cloud Carbon Management Platform.

During the exhibition tour, President Tsai paid close attention to ITRI’s sustainable technologies. She was impressed by the hydrogen tank that is 60% lighter than other models and the virtual power plant that can centralize power from different sources for stable power delivery. President Tsai also praised the fine texture of an eco-friendly backpack made using indigo dyes via low-carbon and non-toxic microbial fermentation. Merits were given to the value of circular technologies and ITRI’s contributions to the textile industry in achieving net-zero emissions.

2022 ITRI Laureates



Paul Por-yuan Wang, PVP Founder and Chairman

He led Pacific Venture Partners (PVP) to become the first in Taiwan to raise funds overseas. For over 30 years, PVP has invested in more than 260 companies and supported them to become listed companies.



T. F. Shiao, Eternal Materials Director and Senior Consultant

He has pivoted Eternal Materials to a multinational corporation that gives Taiwan's electronics manufacturing industries the edge of local sourcing.



Yancey Hai, Delta Electronics Chairman

He has spearheaded Delta Electronics to pioneer in optimizing green building and energy efficiency solutions.



Bowei Lee, LCY Group Chairman

Under his leadership, LCY Group's profit has increased 20 times, and the Taiwan Chemical Industry Association (TCIA) was granted permanent observer membership of the International Council of Chemical Associations (ICCA).



Samuel Yin, Ruentex Group President

His Ruentex Group embodies the paradigm shift from a traditional company to a diversified business enterprise. He has also been listed several times in Forbes Asia's 48 Heroes of Philanthropy in the Asia-Pacific region.



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Industrial Technology Research Institute (ITRI) is one of the world's leading technology R&D institutions aiming to innovate a better future for society. Founded in 1973, ITRI has played a vital role in transforming Taiwan's industries from labor-intensive into innovation-driven. To address market needs and global trends, it has launched its 2030 Technology Strategy & Roadmap and focuses on innovation development in Smart Living, Quality Health, and Sustainable Environment. It also strives to strengthen Intelligentization Enabling Technology to support diversified applications.

Over the years, ITRI has been dedicated to incubating startups and spinoffs, including well-known names such as UMC and TSMC. In addition to its headquarters in Taiwan, ITRI has branch offices in the U.S., Europe, and Japan in an effort to extend its R&D scope and promote international cooperation across the globe. For more information, please visit <https://www.itsri.org/eng>.

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Inquiries:

E-mail: itritoday@itri.org.tw

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Industrial Technology Research Institute

No. 195, Sec.4, Chung Hsing Rd. Chutung, Hsinchu, Taiwan 310401, R.O.C.

Tel: +886-3-582-0100

ITRI Website:

<https://www.itri.org/eng>

ITRI's Overseas Offices

ITRI International Inc.

2880 Zanker Road, Suite 103, San Jose, CA 95134, U.S.A.

Tel: +1-408-428-9988

Fax: +1-408-428-9388

E-mail: info@itri.com

ITRI Japan Office

TTD Bldg., 3F, 1-2-18 Mita, Minato-ku, Tokyo, 108-0073, Japan

Tel: +81-3-54193836

Fax: +81-3-34555079

E-mail: itritokyo@itri.org.tw

ITRI Berlin Office

7 OG., Hohenzollerndamm 187, 10713 Berlin, Germany

Tel: +49-30-8609-360

E-mail: contact_germany@itri.org.tw



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