2015/2016
Annual Report 年報

ASTRI™

香港應用科技研究院有限公司
Hong Kong Applied Science and Technology Research Institute Company Limited

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ASTRI Annual Report 2015 - 2016 應科院年報

About ASTRI

Hong Kong Applied Science and Technology Research Institute (ASTRI) was founded by the Government of the Hong Kong Special Administrative Region in 2000 with the mission of enhancing Hong Kong's competitiveness in technology-based industries through applied research.

ASTRI's core R&D competence in various areas is grouped under seven Technology Divisions, namely Communications Technologies, Electronics Components, IC Design (Analog), IC Design (Digital), Opto-electronics, Security and Data Sciences, and Software and Systems.

Five areas of applications including financial technologies, intelligent manufacturing, next generation network, health technologies, and smart city are identified for major pursuits.

In 2006, ASTRI was designated as the Research and Development Centre for Information and Communications Technologies by the Innovation and Technology Commission. In 2012, ASTRI was given an approval from the State Ministry of Science and Technology (MOST) to establish the first Hong Kong Branch of Chinese National Engineering Research Centre (CNERC) for Application Specific Integrated Circuit System in collaboration with Southeast University (SEU) in Nanjing.

關於應科院

香港應用科技研究院（應科院）由香港特別行政區政府於2000年成立，其使命是要透過應用科技研究，協助發展以科技為基礎的產業，藉此提升香港的競爭力。

應科院的主要科技研發領域可歸納於七個科技部門內，包括：通訊技術、電子元件、集成電路設計（類比）、集成電路設計（數碼）、光電子、信息安全與數據科學，及軟件與系統。

而技術研發主要應用在五項重點範疇包括金融科技、智能製造、新一代通訊網絡、健康科技和智慧城市。

2006年，應科院獲創新科技署指定為「資訊及通訊技術研發中心」。2012年，應科院獲國家科學技術部批准，與南京的東南大學合作，成立本港第一所「國家專用集成電路系統工程技術研究中心香港分中心」。

Vision, Mission, Goals and Values

Our Vision

To be a world-class technology developer and enabler to enrich lives.

Our Mission

To enhance Hong Kong's competitiveness through applied research.

Our Goals

- Perform innovative R&D for greater technological application in industries
- Nurture technology entrepreneurs and talents
- Promote collaborations among universities, R&D institutions and industries to achieve win-win results

願景、使命、目標、核心價值

我們的願景

引領世界創新，締造豐盛人生。

我們的使命

科技產業化，產業智能化。開創香港競爭新世代。

我們的目標

- 領航科技創新，擴大產業應用
- 培育專才，推動創業
- 促進產學研互動協作，創造共贏

Chairman's Foreword

It is my pleasure to present the ASTRI 2015-16 Annual Report to you – my third year-end report since taking over as Chairman of the ASTRI Board of Directors. As the largest government-funded R&D centre in Hong Kong, ASTRI has achieved a great deal over the past year, giving all of us involved with this institution a strong sense of pride and honour.

ASTRI strives to respond to the socio-economic developments in Hong Kong and the opportunities presented by the Mainland. Our forward-looking strategy has given us strong impetus and a clear direction to move forward. For instance, Financial Technology - or FinTech - has become an increasingly crucial element in the field of finance and commerce. Hong Kong has all the right conduits and conditions to ride on this trend and develop into a premier global FinTech hub. If we want to tap into this huge opportunity, we must leverage our infrastructure, expertise, network and location. In addition, we need to make the most of the support we receive from the nation to compete with the rest of the world as a first-rate FinTech hub.

To that end, ASTRI has been working tirelessly to conduct research and pursue innovation in partnership with the industry. Our two-pronged approach involves: A) driving R&D to strengthen the FinTech infrastructure and ecosystem, and B) partnering with the industry to help businesses enhance FinTech tools, address technological needs, and overcome any strategic or operational challenges. During the past year, we have delivered some of the most applauded and innovative FinTech tools that are often seen as model solutions for the industry not just in Hong Kong or Greater China, but also across the region.

As Hong Kong deals with multiple challenges - emanating from different parts and aspects of our society - the task of sustaining the city's momentum becomes increasingly challenging. At ASTRI, we recognise the importance of staying focused on our goals and remaining committed to our path. We should not lose sight of our vision and mission, but persevere in what we should do. We must do our best - to work with total commitment through applied research for the betterment of our society.

The dawning of the era of Industry 4.0 has changed the dynamics of the market and created new industry paradigms. The current trend of automation of data exchange in manufacturing technologies - such as cyber-physical systems, 'Internet of Things', smart factories with intelligent production, and cloud computing - has created a whole new world of potential. With its ample expertise

主席序言

本人十分榮幸跟各位分享2015-16年度香港應用科技研究院年度報告，這是本人自從接任應科院董事局主席以來的第三份年終報告。作為香港最大的政府資助研發中心，應科院在過去一年取得了不少成就，使我們所有參與該機構的成員都感到自豪和光榮。

應科院致力回應香港的社會經濟發展和中國內地所提供的機會，我們釐定了前瞻性的戰略，這給予我們明確的方向和向前邁進的動力。舉例說，金融科技在金融和商業領域方面越顯重要；而香港擁有適當的渠道和條件，我們可以順應這個趨勢，發展成為一個全球性的金融科技中心。如果我們想掌握這個空前的機遇，我們必須憑藉我們的基礎設施、專才、網絡和地利。此外，我們需要充分利用我們從國家獲得的支持，與世界其他地區競爭，以成為頂尖的金融科技中心。

為此，應科院一直努力不懈，與業界合作進行研究和追求創新。我們採用雙管齊下的方針：一）推動研發，加強金融科技基礎設施和生態系統；及二）與業界合作，幫助企業提升金融科技工具，滿足技術需求，克服任何戰略或操作方面的挑戰。過去一年，我們便推出了一些創新且備受推崇的金融科技工具。這些工具不僅在香港或大中華地區，甚至在亞太區內，均被視為業內的模範方案。

由於香港正面對來自社會各方各面的種種挑戰，要保持香港持續向上的動力，確是一項越來越艱巨的任務。我們深明應科院必須專注於我們的目標，並繼續委身在科研的道途上。我們不應忘卻我們的願景和使

and outstanding track record, ASTRI is perfectly placed to assist the Government in stimulating re-industrialisation in Hong Kong.

As FinTech development and re-industrialisation gathers momentum, the transformation of Hong Kong into a smart city is also underway. This has been one of the major focuses of the Government in the past two years, starting from its inclusion in the Chief Executive's Policy Address in 2015 and 2016. ASTRI has a wealth of experience in this field – the competence to take the lead in conducting related research and development. We will engage ever so closely with the industry, research institutes and the academia to help transform Hong Kong into a city of smart living.

Turning from the industry to our society, an ageing population presents new and heavy demand for advanced healthcare solutions. ASTRI has been working closely with the medical and healthcare community to conduct R&D in health technologies with encouraging results. We are delighted to see that our sincere efforts show genuine promises of benefitting not only our elderly population, but also their families, the healthcare industry, the Government and the community as a whole.

Turning our attention to the Mainland, the rapid economic growth of our nation offers unprecedented and enviable opportunities. Flagship initiatives like 'Made in China 2025' and 'Belt and Road' are indeed once-in-a-lifetime

命；相反，我們要堅持我們的信念，盡最大努力，專心致志透過應用科技研究令我們的社會更加美好。

工業4.0時代的到來，改變了市場的動態，創造了新的行業模式。目前在製造技術（如網絡物理系統、物聯網、智能工廠與智能生產，以及雲端計算）中，數據交換自動化的趨勢已經創造了一個全新且極具潛力的世界。憑藉豐富的專業知識和傑出的業績，應科院可協助政府再次刺激本地的工業生產。

隨著金融科技和再工業化的發展，香港勢將轉型成為一個智慧城市。這是政府在過去兩年的施政重點之一，有關政策亦在2015年及2016年行政長官的施政報告內提出。應科院在這方面具有豐富的經驗，有能力帶頭進行相關的研究和發展。我們會與業界、研究機構和學術界緊密合作，協助香港成為一個智慧生活之城。

從工業走向社會議題，隨著人口老化的趨勢，香港人對先進醫療保健方面的訴求越來越大。應科院與醫療和保健界緊密合作，在保健技術方面進行研究，並取得令人鼓舞的成果。我們很高興看到我們摯誠的努力，能真切地回應了社會的訴求，不單令我們的長者受惠，更令他們的家庭、醫療界、政府，以至整個社會得益不淺。

Delegates from Hong Kong Police College visits ASTRI to explore collaboration opportunities. Mr Paul Lau* (left), Assistant Commissioner of Police, Director of Hong Kong Police College and Mr Wong Ming-yam (right), BBS, JP, Chairman of the Board of ASTRI
香港警察學院代表造訪應科院探討合作機會。圖左為助理警務處處長及香港警察學院院長劉保祿先生*，圖右為應科院董事局主席王明鑫先生，BBS，JP

*Mr Paul Lau has retired from the post of Assistant Commissioner of Police, Director of Hong Kong Police College
劉保祿先生現已榮休助理警務處處長及香港警察學院院長一職

opportunities for Hong Kong. China is in full swing to pursue innovation-driven development, prompting intense application of smart technologies and adoption of green development in order to achieve a makeover to its manufacturing industry. The nation is determined to move its manufacturing industry up the value chain - no longer to remain a 'world factory' that churns out economical products, instead to become a manufacturer of quality, high-value goods. Hong Kong has a critical role to play in this transformation. It can provide the expertise and technological know-how much needed by industry players in the Mainland in the areas of, for instance, quality control software and systems, smart logistics and delivery tracking devices, etc.

The 'Belt and Road' initiative, on the other hand, demands a special and unique role for Hong Kong as a 'super-connector' facilitating connections across some 60 economies along the one belt. With communication technologies, next generation network, security and data sciences, software and systems, and low-power design among its core competence. ASTRI can greatly facilitate in Hong Kong's role as a 'super-connector' between the 'Belt and Road' countries in addition to bolstering the massive development efforts in China through advanced technological solutions.

Looking ahead, ASTRI will continue to be guided by its vision of becoming a world-class developer and enabler that enriches lives. We are confident that we have the right mix of competence to not only support but also shape the development trends in our region. We shall spare no efforts in nurturing technology entrepreneurs and talents for society. Collaboration with industries, universities and R&D institutes will remain a key focus area for us – enabling ASTRI to strive and flourish in the field of research and innovation.

Most importantly, we shall, by no means, take a complacent approach. We will continue to think fast, learn fast and act fast – to protect and enhance our competitive edge.

I'd like to thank the Government's Innovation and Technology Bureau and Innovation and Technology Commission for their continued support and guidance. Backed by them, ASTRI has been able to take all these bold and great strides in the past year. I am also grateful to the Board of Directors for their leadership and encouragement, and to all the staff members at ASTRI for their hard work, dedication and commitment. Without the support and contribution from all our stakeholders and team members, none of the great progress made throughout 2015-16 would have been possible. My deep gratitude and appreciation to you all!

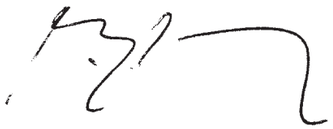
當我們把目光轉向中國內地，我國快速的經濟增長提供了前所未有且令人羨慕的機會。像「中國製造2025」和「一帶一路」這樣的旗艦計劃，對香港確實是千載難逢的機遇。中國正在全力推動創新，並希望藉此能帶動整體發展，促使各界積極應用智能技術，並採納綠色發展，以實現其製造業的改造。國家決心將其製造業推向價值鏈的上層，不再是一個製造價格便宜產品的「世界工廠」，而是成為高質量、高價值產品的製造商。香港在這個轉型過程中扮演著相當重要的角色。我們可以向內地業界提供所需要的專才和技術支援，諸如在軟件和系統的質量控制、智能物流和交付追踪設備等領域。

另一方面，在「一帶一路」的倡議中，香港將發揮特殊和獨特的作用，並扮演「超級連接器」的角色，促進一帶一路沿線大約六十個經濟體的連接。而應科院憑藉在通訊科技、新一代網絡、信息安全及數據科學、軟件及系統，以及低功耗設計等方面的科研實力，大大促進香港成為「一帶一路」國家之間的「超級連接器」，同時通過先進的技術方案來支持中國的大規模發展。

展望未來，應科院將繼續朝着成為世界級引領創新發展的科研機構這願景進發，並希望藉科技提升人們生活素質。我們相信，我們有合適的才能和實力，以支持和塑造亞洲區的發展趨勢。我們將不遺餘力為社會培育技術企業家和人才。與業界、大學和研發機構的合作依然是我們向前的重點，藉以使應科院能夠在研究和創新領域上繼續努力和蓬勃發展。

最重要的是，我們絕不能自滿。我們將繼續敏捷思考、快快學習和迅速行動，以保持和提高我們的競爭優勢。

我要感謝政府創新及科技局及創新科技署的持續支持和指導。有他們的支持，應科院在過去一年能以果敢踏出一大步。我也感謝董事會的領導和鼓勵，以及應科院所有員工的努力、奉獻和付出。沒有所有持份者和團隊成員的支持和貢獻，整個2015-16年度取得的卓越成績都不可能實現。我深深的感謝和讚賞大家！



Wong Ming-yam 王明鑫
Chairman of the Board
董事局主席

Chief Executive Officer's Review

Hong Kong Applied Science and Technology Research Institute (ASTRI) is a cutting-edge technology developer thriving on our collaboration with the industry and enhancing the competitiveness of Hong Kong through applied research. In my second year as the Chief Executive Officer of ASTRI, I am pleased to present the 2015-16 ASTRI work review. In this review, you will be happy to see the great achievements we have had, and the strong progress we have made based on the strategic direction set forth in the 2014-15 plan.

Our research and development efforts seek to deliver innovative solutions with real, practical value. To ensure objective alignment and synergy in our research, we identified and grouped our core strengths. Together with the Hong Kong Branch of the Chinese National Engineering Research Centre (CNERC), we form our 5+1 strategic pillars.

行政總裁回顧

香港應用科技研究院致力研發尖端的科技，並透過與業界緊密合作，提升香港的競爭力，從而促進本地蓬勃發展。踏進我作應科院行政總裁職任的第二年，我很高興地跟大家分享2015-16年度應科院工作回顧。在這回顧中，大家將會欣見應科院根據2014-15年度所制定的戰略發展方向，在過去一個年度內取得美好的成就和穩健的進展。

在過去一年，我們在研發工作上努力不懈，目的是制定一些具有真實和實用價值的創新方案。為了確保我們研究方向目標一致和能以產生理想的協同效應，我們確立我們所擁有的研發強項，並歸納為五個重點研發領域，同時我們也致力拓展應科院內之國家專用集成電路系統工程技術研究中心香港分中心的工作。以上的工作方向，簡稱為「5 + 1」發展策略。

5+1 Strategy 研發戰略

Financial Technologies (FinTech) 金融科技

Intelligent Manufacturing (IM) 智能製造

Next Generation Network (NGN) 新一代通訊網絡

Health Technologies (HT) 健康科技

Smart City (SC) 智慧城市

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Hong Kong Branch of the Chinese National Engineering Research Centre for Application Specific Intergrated Circuit System (CNERC)

國家專用集成電路系統工程技術研究中心
香港分中心

ASTRI has the expertise, experience, state-of-the-art facilities and the network to deliver pioneering, research-led projects in each of the strategic areas. Extensive collaboration and exchange platforms enable the technologies developed by our researchers to be successfully commercialised into industry applications. Through effective technology transfers, we are not only helping the industry to perform better today, but also building a foundation for strong and sustainable future development.

An important element of ASTRI's strategic competence is its partnership with the financial services industry. The global financial sector has experienced great changes and transformations over the last few years – FinTech is one of the most prominent change agents among those. ASTRI has a strong pool of R&D initiatives in the FinTech space and has already established partnerships with regulators, banks, insurers, technology companies, and other players in the financial industry. Many of our FinTech solutions - such as advanced authentication technologies, cybersecurity protection, next generation facial/voice recognition, behavioural biometrics authentication, deep learning with artificial intelligence, and big data analytics– have been embraced by the industry as 'model standards'. We are active in the areas of Blockchain, cybersecurity intelligence, facial recognition and internet finance, and boast state-of-the-art facilities such as ASTRI Security Laboratory and Cyber Range Laboratory. All these will help strengthen Hong Kong's financial infrastructure, enhance business efficiency, and improve customer experience.

應科院擁有專業知識、經驗、先進的設施和網絡，在每個戰略領域上，我們開展不同創新及以研究為主導的項目。透過廣泛的協作和交換平台，讓我們所開發的技術得以成功地應用在不同業界，並使之商業化。通過有效的技術轉讓，我們不僅幫助業界在今天取得成果，更為其將來持續發展和達到更佳的績效奠定了基礎。

應科院戰略能力的其中一個重要元素，是我們與金融服務業所建立夥伴關係。全球金融業在過去幾年經歷了巨大的變化和變革，金融科技是環球金融變革的其中一項至為重要的催化劑。應科院在金融科技領域方面有一籃子的研發計劃，並已與監管機構、銀行、保險公司、技術公司和金融業的其他持份者建立了合作夥伴關係。我們所研發的許多金融科技方案，如先進的認證技術、網絡安全保障、新一代的面部/語音識別、行為生物識

Another major ASTRI R&D effort is the development of a Next Generation Network (NGN). We were the first in Hong Kong to test-bed 5G technology – a platform that will facilitate 'Smart City' technologies and the 'Internet of Things (IoT). Building on our success with LTE, we launched 5G research in 2013, followed by our NGN initiative in 2014. Backed by the Innovation and Technology Fund (ITF) and strong support from industry partners, our NGN initiative is already contributing to the commercialisation of new services under 4G LTE and facilitating 5G system research and standardisation. We have partnered with key industry leaders to showcase our latest innovations on NGN initiative including LTE/5G and Network Functions Virtualisation (NFV) technologies at prominent international exhibitions such as the PT/EXPO and Mobile World Congress in Shanghai and Barcelona.

The advent of a smart city will redefine our lives in more ways than one can imagine – from infrastructure to transportation, waste management to energy, finance to healthcare, everything will change for the better and faster. The launch of 5G network will enable smart technologies to be applied in every possible part of our daily lives, realising the Government's plans to turn Hong Kong into a smart city. ASTRI is actively working with different stakeholders from the Government, industries, academic and scientific communities to deliver solutions that will make Hong Kong fully ready and resourced for that leap.

In the past year, we have formed strategic alliances with a number of long-standing partners. We have set up an R&D centre jointly with Truly International Holdings Limited (TRULY) to develop technologies for intelligent internet terminal, intelligent automobile, and Industry 4.0. Our R&D centre focusing on SAE Magnetics (Hong Kong) Limited's group-wide research and innovation covers developments like building a smart city. At the national level, we have initiated research and development partnerships with reputed institutions such as the Beijing Institute of Collaborative Innovation (BICI); Academy of Broadcasting Science of the State Administration of Press, Publication, Radio, Film and Television (SAPPRFT); and Shanghai Huahong Integrated Circuit Company Limited. We have

別認證、深度學習與人工智能和大數據分析等，已被業界稱為「模範標準」。我們積極參與區塊鏈、網絡安全智能、面部識別和互聯網金融等研發工作，並擁有最先進的設施，如應科院網絡安全研究所和網絡安全研究與培訓中心。這些都有助加強香港的金融基建設施、提高業務效率及改善客戶體驗。

應科院的另一項主要研發工作是開發新一代網絡。我們是首家在香港測試5G技術的研究所。而這測試平台將有助本港發展「智慧城市」技術和「物聯網」。基於我們在LTE方面取得的成果，我們在2013年推出了5G研究，接着在2014年推出新一代網絡計劃。在創新及科技基金和業界合作夥伴的大力支持下，我們的新一代網絡計劃已經為4G LTE新業務的商業化作出了貢獻，同時也促進了5G系統的研究和標準化。我們與業內的大企業合作，在中國國際信息通訊展覽會及在上海和巴塞隆納舉辦的世界移動通訊大會等知名國際展會上，展示了我們在新一代網絡計劃上最新研發的成果，包括LTE/5G和網絡功能虛擬化技術。

隨著智慧城市的發展，未來的科技將以我們無法想像的方式重新為我們的生活下定義，從基建設施到運輸，廢物管理到能源，金融到醫療保健，一切都將會變得更好、更快捷、更便利。隨著5G網絡的推出，我們可把智能科技應用於日常生活的各個環節，這些科技亦有助特區政府把香港建設為一個智慧城市。應科院正與政府、業界、學術界和科學界的不同持份者積極合作，研發創新方案，使香港準備就緒，並配備妥善資源，以迎接智能時代的來臨。

在過去一年中，我們與一些長期合作夥伴建立了戰略聯盟。我們與信利國際聯合建立了研發中心，開發智能互聯網終端、智能汽

also opened a joint laboratory on 'Internet of Things' and wireless applications.

Our endeavour to make a difference to people's lives is reflected in the way we bring the benefits of technology to everyday affairs like healthcare, communications, transport, and access to information. Solutions for cardiovascular monitoring, measurement of blood glucose, and interactive information panel for the elderly are a few examples – that's how we contribute to the Government's efforts to build a smart Hong Kong. Many of our technologies have already been commercialised in Hong Kong and the Mainland – benefitting citizens and helping the elderly in particular.

Throughout the year, we have organised a number of events, conferences and workshops involving the industry, and the academic and scientific sectors. These platforms facilitate sharing of ideas, insights and

車和工業4.0的技術。我們又與新科實業集團合作，專注研發創新科技，其中涵蓋了建設智慧城市的項目。在國家層面上，我們與國內知名機構建立了研發合作夥伴關係，其中包括北京協同創新研究院、國家新聞出版廣電總局廣播科學研究院和上海華虹集成電路有限責任公司。我們還開設了一個「物聯網」和無線應用技術的聯合實驗室。

應科院致力改善人們的生活，我們不斷努力把嶄新的科技應用到日常生活中，如：醫療保健、通訊、運輸及資訊的範疇上。就如我們在心血管監測、血糖測量和長者互動信息錶板等方面推出新的方案，便是一些好的例子，說明應科院為特區政府建立一個智慧城市而出的一分力。我們有許多技術已經在香港和中國內地商業化，令市民和長者同受裨益。

Dr Frank Tong, Chief Executive Officer of ASTRI speaks at the Industry and University Collaboration Forum (IUCF) 2015
應科院行政總裁湯復基博士於產學研合作論壇2015上發表演說

resources. A major highlight in our events calendar was the Industry and University Collaboration Forum (IUCF) 2015 – ASTRI's signature annual event to discuss about latest technological development and cultivate cross-sector or cross-border collaborations. ASTRI demonstrated different solutions and technologies at the event which was attended by over 400 people. In addition to hosting events, we sent delegations to several other conferences and workshops to exchange knowledge and ideas, and to showcase our own initiatives.

In 2015, ASTRI orchestrated its R&D efforts to deliver impactful results in each of the '5+1' strategic pillars. We are delighted to see that the Government is providing comprehensive policy, financial, technological and infrastructural support to develop Hong Kong into a

在這一年中，我們與業界、學術和科學界舉辦了很多活動、會議和工作坊。這些平台可讓不同持份者分享構想、灼見和資源。其中產學研合作論壇2015就是一年一度的旗艦活動，讓與會者討論最新的技術發展，並有助促成跨界別或跨境的協作。應科院在活動中展示了不同的方案和技術，去年是項活動的參加者超過四百人。除了主辦活動外，我們還派代表團參加了其他在本地及海外舉辦的會議和工作坊，以交流知識和想法，並展示應科院的科研項目。

2015年，應科院「5+1」戰略方向取得了驕人的績效。我們很高興看到政府正推行全面的政策，又提供財政、科技和基建支援，以發展香港成為知識型經濟和創新中心。前面

knowledge-based economy and an innovation hub. The future is bright while challenges are in no way small. ASTRI will spare no efforts in fostering innovation and technological advancement for the people in Hong Kong, the Mainland and beyond. We will continue to make significant investments in R&D infrastructure and conduct cutting-edge research, transfer our technologies for commercialisation, collaborate with universities and research institutes to nurture talents in applied science and technology, and support Hong Kong as a regional FinTech hub and a smart city. We will seek to contribute through our expertise to the technological advancement of Hong Kong and our nation as a whole.

Before closing, I would like to convey my heartfelt appreciation to the Innovation and Technology Bureau and the Innovation and Technology Commission of the SAR Government. I am grateful to the Chairman and all members of the Board of Directors for their guidance, support and leadership. We have also been very fortunate to be joined by so many first-rate scientists and researchers, and a very dedicated and competent team of staff who constantly demonstrate their 'can do' spirit, even in adverse situations. It is a privilege to work with such a capable and passionate team.

Together, let's build on our successes from 2015-16, and make the coming months and years even more fruitful.

的挑戰雖然不小，但我們的未來是充滿希望的。應科院將不遺餘力，推動香港、內地及境外地區的創新及科技進步。我們將繼續在研發基礎設施方面進行重大投資，開展前瞻的研究，把我們的技術轉授業界，使之商業化，又與大學和研究機構合作，培育應用科技人才，支持香港成為亞洲區內首屈一指的金融科技中心和智慧城市。我們會致力透過我們的專業知識，為香港和整個國家的科技進步作出貢獻。

最後，我謹向特區政府的創新及科技局和創新科技署致以衷心的感謝。同時我又感謝董事局主席和所有成員的導引、支持和領導。我們非常幸運能有一支由眾多卓越的科學家和研究人員，並敬業而能幹的後勤員工所組成的工作團隊。我們不斷迎難而上，時刻展示「我們定能做到」精神。能在這樣一支實幹和充滿熱情的團隊中工作，實是一種榮幸。

讓我們一同在2015-2016年的成功基礎上繼續努力，創造更豐盛的未來。

Frank Tong Fuk-kay 湯復基
Chief Executive Officer
行政總裁

ASTRI Annual Report 2015 - 2016 應科院年報

Corporate Governance 企業管治

Front row (from left): Ms Annie Choi Suk Han, JP, Mr Cheuk Wing Hing, JP, Mr Kwong Chi Keung, JP, Professor Roland Chin Tai Hong, BBS, JP, Dr Meikei Ieong, Dr Frank Tong, Mr Wong Ming Yam, BBS, JP, Ms Ivy Leung, Ms Cammy Yung, Dr Davy Lo Kwok Wai, Dr K C Sum
Back row (from left): Ms Alsa Choi, Mr Johann C Y Wong, JP, Mr Humphrey Choi Chor Ching, JP, Ms Agnes Nardi Kar Wai, Professor Ching Pak Chung, BBS, Professor Philip Chan Ching Ho, BBS, Dr Tiger Lin Zhenhui, Mr Vincent Tang, Mr Tony Choi Siu Chow, Mr Sunny Lee Wai Kwong, JP, Ms Cally Chan Shan Shan, Mr Ha Yung Kuen, BBS, Mr Andy Liu An Ting, Professor Andrew Chan Chi Fai, SBS, JP
前排（從左起）：蔡淑嫻女士，太平紳士、卓永興先生，太平紳士、鄺志強先生，太平紳士、錢大康教授，銅紫荊星章，太平紳士、楊美基博士、湯復基博士、王明鑫先生，銅紫荊星章，太平紳士、梁穎莊女士、容慧琪女士、羅國威博士、岑錦聰博士
後排（從左起）：蔡碧真女士、黃宗殷先生，太平紳士、蔡楚清先生，太平紳士、李家慧女士、程伯中教授，銅紫荊星章、陳正豪教授，銅紫荊星章、林振輝博士、 鄧智良先生、蔡少洲先生、李惠光先生，太平紳士、陳珊珊女士、夏勇權先生，銅紫荊星章、劉安庭先生、陳志輝教授，銀紫荊星章，太平紳士

Board of Directors

ASTRI is governed by a Board of Directors comprising representatives from the industrial and commercial sectors, the academia, and the HKSAR Government. Directors are appointed by the Government and have collective responsibility for ASTRI's leadership, policies and strategic directions.

To ensure good governance, the Board with the support of the management, responds flexibly to, and reflects on, the changing terms and conditions of the business environment in which ASTRI operates. The key focus remains the needs of the industrial sector.

The Board and the management adhere to the four key management objectives of ASTRI: Transparency, Efficiency, User-friendliness and Governance.

董事局

董事局是應科院的管治組織，成員包括來自工商界、學術界及香港特區政府的代表。董事是由特區政府委任，負責制訂應科院的發展政策和路向。

為實施良好的管治，應科院董事局得到管理層的全力支持，以因應不斷轉變的營商環境和條件作出靈活應變，及配合工業界需要為主要的工作目標。

董事局和管理層堅持四個主要管理原則：高透明度、高效率、切合需要和妥善管治。

Board Composition

As at 31 March 2016, the Board is comprised of the Chairman, two official members, and 17 members.

Chairman

Mr Wong Ming Yam, BBS, JP
Director, eSpot Lighting Limited

Official Members

Mr Cheuk Wing Hing, JP
Permanent Secretary for Innovation and Technology, Innovation and Technology Bureau

Ms Annie Choi Suk Han, JP
Commissioner for Innovation and Technology, Innovation and Technology Commission

Members (In alphabetical order according to surname)

Professor Andrew Chan Chi Fai, SBS, JP
Director, EMBA Programme, The Chinese University of Hong Kong

Professor Philip Chan Ching Ho, BBS
Deputy President and Provost, The Hong Kong Polytechnic University

Ms Cally Chan Shan Shan
Managing Director, Hewlett-Packard Hong Kong SAR Limited

Mr Chuck Cheng Cheuk Wing
CEO & President, Appotech Limited

Professor Roland Chin Tai Hong, BBS, JP
President & Vice-Chancellor, Hong Kong Baptist University

Professor Ching Pak Chung, BBS
Choh-ming Li Professor of Electronic Engineering, Director of Shun Hing Institute of Advanced Engineering, The Chinese University of Hong Kong

Mr Humphrey Choi Chor Ching, JP
Partner, PricewaterhouseCoopers

董事局的組成

截至2016年3月31日，董事局成員包括主席、兩位官守董事及十七位董事。

主席

王明鑫先生，銅紫荊星章，太平紳士
螢輝科技有限公司董事

官守董事

卓永興先生，太平紳士
創新及科技局常任秘書長

蔡淑嫻女士，太平紳士
創新科技署署長

董事（以英文姓氏順序排列）

陳志輝教授，銀紫荊星章，太平紳士
香港中文大學行政人員工商管理碩士課程主任

陳正豪教授，銅紫荊星章
香港理工大學常務及學務副校長

陳珊珊女士
Hewlett-Packard Hong Kong SAR Limited
董事總經理

鄭灼榮先生
卓榮集成電路科技有限公司總裁

錢大康教授，銅紫荊星章，太平紳士
香港浸會大學校長

程伯中教授，銅紫荊星章
香港中文大學卓敏電子工程學系講座教授，
香港中文大學信興高等工程研究所所長

蔡楚清先生，太平紳士
羅兵咸永道會計師事務所合夥人

Mr Tony Choi Siu Chow
Executive Director, Hong Kong Garment Manufacturing Co. Ltd.

Mr Ha Yung Kuen, BBS

Mr Kwong Chi Keung, JP
Senior Partner, Sit, Fung, Kwong & Shum Solicitors & Notaries

Ir Dr Alan Lam Hiu Fung
Chief Executive Officer, Sengital Limited

Mr Sunny Lee Wai Kwong, JP
Vice-President (Administration), City University of Hong Kong

Dr Tiger Lin Zhenhui
Executive Director & Chief Executive Officer, CITIC Telecom International Holdings Limited

Mr Andy Liu An Ting
Vice Chairman, Hong Kong Biotechnology Organisation

Dr Davy Lo Kwok Wai
Consultant

Ms Agnes Nardi Kar Wai

Mr Denis Tse Tik Yang
Managing Principal, Asia-IO Advisors Limited

蔡少洲先生
百達製衣有限公司執行董事

夏勇權先生，銅紫荊星章

鄺志強先生，太平紳士
薛馮鄺岑律師行高級合夥人

林曉鋒博士，工程師
港科研有限公司行政總裁

李惠光先生，太平紳士
香港城市大學副校長（行政）

林振輝博士
中信國際電訊集團有限公司執行董事及行政總裁

劉安庭先生
香港生物科技協會副主席

羅國威博士
顧問

李家慧女士

謝迪洋先生
Asia-IO Advisors Limited管理合伙人

Functional Committees

Three functional committees, namely Finance and Administration Committee (FAC), Technology Committee (TC) and Audit Committee (AC) were formed to assist the Board in managing ASTRI. FAC oversees ASTRI's financial and administrative matters; TC oversees research initiatives; and AC ensures both internal and external audit processes are properly carried out.

The committee memberships as at 31 March 2016 are:

功能委員會

董事局成立了三個功能委員會，即財務與行政委員會、科技委員會及審計委員會，以協助董事局管治應科院。財務與行政委員會監察應科院財務及行政事宜；科技委員會監察應科院的研究項目；審計委員會則確保內部及外部審計程序妥善執行。

以下是截至2016年3月31日的委員會成員名單:

Finance and Administration Committee

Mr Wong Ming Yam, BBS, JP (Chairman)
Ms Cally Chan Shan Shan
Ms Annie Choi Suk Han, JP
Mr Ha Yung Kuen, BBS
Mr Andy Liu An Ting
Dr Davy Lo Kwok Wai
Ms Agnes Nardi Kar Wai
Mr Denis Tse Tik Yang

財務與行政委員會

王明鑫先生，銅紫荊星章，太平紳士（主席）
陳珊珊女士
蔡淑嫻女士，太平紳士
夏勇權先生，銅紫荊星章
劉安庭先生
羅國威博士
李家慧女士
謝迪洋先生

Technology Committee

Professor Philip Chan Ching Ho, BBS (Chairman)
Ms Cally Chan Shan Shan
Mr Chuck Cheng Cheuk Wing
Professor Roland Chin Tai Hong, BBS, JP
Professor Ching Pak Chung, BBS
Ms Annie Choi Suk Han, JP
Mr Tony Choi Siu Chow
Mr Ha Yung Kuen, BBS
Ir Dr Alan Lam Hiu Fung
Mr Sunny Lee Wai Kwong, JP
Dr Tiger Lin Zhenhui
Dr Davy Lo Kwok Wai
Ms Agnes Nardi Kar Wai
Mr Wong Ming Yam, BBS, JP

科技委員會

陳正豪教授，銅紫荊星章（主席）
陳珊珊女士
鄭灼榮先生
錢大康教授，銅紫荊星章，太平紳士
程伯中教授，銅紫荊星章
蔡淑嫻女士，太平紳士
蔡少洲先生
夏勇權先生，銅紫荊星章
林曉鋒博士，工程師
李惠光先生，太平紳士
林振輝博士
羅國威博士
李家慧女士
王明鑫先生，銅紫荊星章，太平紳士

Audit Committee

Mr Humphrey Choi Chor Ching, JP (Chairman)
Professor Ching Pak Chung, BBS
Ms Annie Choi Suk Han, JP
Mr Kwong Chi Keung, JP
Ir Dr Alan Lam Hiu Fung

審計委員會

蔡楚清先生，太平紳士 （主席）
程伯中教授，銅紫荊星章
蔡淑嫻女士，太平紳士
鄺志強先生，太平紳士
林曉鋒博士，工程師

Movements of Directors

董事局成員變動

New Directors 新委任董事	Date of Appointment 委任日期
Mr Johann Wong Chung Yan, JP 黃宗殷先生，太平紳士	15 July 2015 2015年7月15日
Ms Annie Choi Suk Han, JP 蔡淑嫻女士，太平紳士	19 August 2015 2015年8月19日
Mr Cheuk Wing Hing, JP 卓永興先生，太平紳士	23 November 2015 2015年11月23日
Mr Andy Liu An Ting 劉安庭先生	1 March 2016 2016年3月1日

Retired Directors 退任董事	Date of Retirement 退任日期
Ms Janet Wong Wing Chen, JP 王榮珍女士，太平紳士	15 July 2015 2015年7月15日
Mr Johann Wong Chung Yan, JP 黃宗殷先生，太平紳士	19 August 2015 2015年8月19日
Ms Susie Ho Shuk Yee, JP 何淑兒女士，太平紳士	23 November 2015 2015年11月23日

Meeting and Attendance

The Board and the three functional committees convene meetings on a regular basis. Special meetings are held as and when necessary.

The following are attendance records of ASTRI Board and the functional committee meetings held during the year:

會議及出席率

董事局及三個功能委員會定期舉行會議，並於有需要時召開特別會議。

以下是董事局會議及各功能委員會於本年度的會議出席紀錄：

Board Meetings 董事局會議	09/04/2015	25/06/2015	25/09/2015	01/12/2015	17/12/2015
Total Number of Directors during the Period 期內董事局成員人數	19	19	19	19	19
Total Number of Directors Present at Meeting 董事出席人數	16	15	14	13	17
Total Number of Apologies 缺席人數	3	4	5	6	2
Group Attendance in Percentage 出席率	84%	79%	74%	68%	89%

Finance and Administration Committee Meetings 財務與行政委員會會議	02/06/2015	01/09/2015	11/11/2015	01/03/2016
Total Number of Directors during the Period 期內董事局成員人數	7	7	7	7
Total Number of Directors Present at Meeting 董事出席人數	6	6	6	6
Total Number of Apologies 缺席人數	1	1	1	1
Group Attendance in Percentage 出席率	86%	86%	86%	86%

Technology Committee Meetings 科技委員會會議	10/06/2015	10/09/2015	01/12/2015	22/03/2016
Total Number of Directors during the Period 期內董事局成員人數	14	14	14	14
Total Number of Directors Present at Meeting 董事出席人數	12	12	12	10
Total Number of Apologies 缺席人數	2	2	2	4
Group Attendance in Percentage 出席率	86%	86%	86%	71%

Audit Committee Meetings 審計委員會會議	16/06/2015	18/09/2015	26/11/2015	15/01/2016	15/03/2016
Total Number of Directors during the Period 期內董事局成員人數	5	5	5	5	5
Total Number of Directors Present at Meeting 董事出席人數	4	5	5	5	5
Total Number of Apologies 缺席人數	1	0	0	0	0
Group Attendance in Percentage 出席率	80%	100%	100%	100%	100%

Corporate Governance Manual

ASTRI adopts a Corporate Governance Manual which clearly states its policies and principles in achieving good governance. The Manual has facilitated the Board and the management to operate and oversee ASTRI's business in a transparent and accountable manner.

Sections of the Manual are being updated and modified, taking into account changes and developments required for improving ASTRI's operations, as well as responding flexibly to, and reflecting on, the changing terms and conditions of the business environment in which ASTRI operates.

Internal Audit

To efficiently exercise good corporate governance, an Internal Audit Department (IAD) under the Audit Committee was set up in 2003 to assist the Board by providing it with information and assurance on internal controls. Since July 2013, an Internal Audit Charter has been introduced into the Corporate Governance Manual. Among other things, the Charter sets out more clearly the responsibilities, independence, authority, planning and reporting processes of the IAD.

During the year, various internal audit reviews were carried out in accordance with the Internal Audit Annual Plan approved by the Audit Committee. In general, the reviews found that all relevant regulations were observed and significant controls were in place. Reports and recommendations of these reviews were submitted to the Audit Committee for consideration.

Compliance

In April 2007, the Board appointed the Head of Internal Audit as Compliance Officer to assist its governance by reporting significant non-compliance issues brought to his attention by a team of Departmental Compliance Officers. The Compliance Officer has since been submitting quarterly reports to the Audit Committee on significant compliance issues.

企業管治手冊

應科院制定企業管治手冊，清楚列明達致優良管治的政策和原則，以協助董事局和管理層以高透明度和負責任地經營及監督應科院的業務。

應科院現正更新企業管治手冊中多個段落，把對改善應科院運作所必要的轉變和發展涵蓋在內，及對應科院所處之營運環境的轉變作靈活的應對和考量。

內部審計

為有效進行良好的企業管治，應科院於2003年成立內部審計部門，隸屬於審計委員會，協助董事局，向其提供有關內部管理控制的資訊及保證。自2013年7月起，企業管治手冊加入內部審計章程，更明確地列明內部審計部門的職責、獨立性、職權範圍、規劃及滙報等事項。

按照審計委員會批核的內部審計年度計劃，應科院於過去一年進行了各項內部審計檢視。總的來說，年度檢討顯示應科院大體已遵從所有相關的規章，而且亦已制定重要的監控措施。而這些檢討報告和有關建議，亦已提交審計委員會審議。

合規

2007年4月，董事局委任內部審計部門主管擔任合規主任，協助董事局進行企業管治，就各部門之合規主任所提請的重大不合規事項作匯報。自此以後，合規主任須就重要的合規議題，向審計委員會提交季度報告。

Safeguard Against Conflicts of Interest

As a public organisation, it is important for ASTRI to have an effective mechanism to safeguard against conflicts of interest. ASTRI is initiating a review of the Code of Conduct for Employees to ensure the effectiveness of the system in detecting potential conflicts and managing declared ones. An updated Code of Conduct is expected to be promulgated in 2016-17.

Workplace Policy

ASTRI is committed to providing a workplace that is zero-tolerant to discrimination and harassment. With a view to promoting equal opportunities in workplace, ASTRI organises seminars related to the anti-discrimination regulations on a regular basis.

Risk Management and Control

Under the direction and guidance of the Board through the Audit Committee, the management and the IAD conducted a company-wide Risk Profiling and Assessment exercise in 2010. Several risk-prone areas were identified and the management took prompt actions to ensure that preventive controls were in place. A Risk Register was then formulated and would be updated when necessary to enhance effective governance of ASTRI.

ISO-based Quality Management System and Information Security Management System

ASTRI received a surveillance audit on ISO 9001:2008 certification in May 2015 confirming that ASTRI's business operation is fully compliant with the international quality management system standards.

In December 2015, ASTRI achieved ISO 27001:2013 certification on the research, development and commercialisation of financial technologies. No non-conformity was found in the certification audit, indicating that ASTRI's FinTech projects are fully compliant with the international information security management system standards.

防範利益衝突

作為一所公營機構，應科院需要一個有效的機制來防範利益衝突。為確保該機制在發現潛在衝突和管理已申報的衝突方面的有效性，應科院現正展開員工行為守則的檢討。我們期望在2016-17年度發佈已更新的員工行為守則。

工作環境守則

應科院致力提供一個沒有歧視和騷擾的良好工作環境。為了提倡工作環境中的平等機會，應科院定期舉行有關反歧視條例的研討會。

風險管理和控制

管理層和內部審計部門在董事局轄下之審計委員會指導下，於2010年進行了一項全公司的風險分析與評估的工作，並確定了幾個高風險範疇，管理層也採取了迅速行動，以訂定相關的防範監控措施，以應付該些風險。「風險登記冊」已經制定，並會按需要作出更新，以進一步加強應科院的有效管治。

以ISO為基礎的品質管理系統及資訊保安管理系統

應科院於2015年5月取得ISO 9001:2008認證，確認了應科院的業務運作完全符合國際質量管理體系標準。

於2015年12月，應科院在金融科技的研究、開發和商業化方面，獲得ISO 27001:2013認證。在認證審計過程中，並沒有發現不合規項目，這顯示應科院的金融科技項目完全符合國際資訊保安管理系統標準。

People

人才匯聚

From left: Ms Ivy Leung, Chief Administrative Officer, Dr Meikei Ieong, Chief Technology Officer, Dr Frank Tong, Chief Executive Officer, and Ms Cammy Yung, Chief Financial Officer
左起: 首席行政總監梁穎莊女士、首席科技總監楊美基博士、行政總裁湯復基博士及首席財務總監容慧琪女士

Senior Management

As at 31 March 2016, composition of the senior management is:

Headquarters Executives

Dr Frank Tong Fuk-kay, Chief Executive Officer

Dr Meikei Ieong, Chief Technology Officer

Dr Jack Lau, Chief Marketing Officer (departed on 6 January 2016)

Ms Ivy Leung, Chief Administrative Officer

Ms Cammy Yung, Chief Financial Officer

Mr David Kwong, Senior Advisor to CEO (departed on 18 September 2015)

Technology Division Heads

Dr Justin Chuang, Vice President and Group Director, Communications Technologies cum Acting Director of Software and Systems

Mr Yiu-kei Li, Director, IC Design (Digital)

Dr Jay Liou, Director, Software and Systems (departed on 14 September 2015)

Dr Daniel Shi, Director, Electronics Components

Dr Duncan Wong, Director, Security and Data Sciences

Dr Enboa Wu, Vice President and Group Director, Opto-electronics (departed on 11 July 2015)

Mr Bill Zhang, Director, IC Design (Analog)

Dr KC Wang, Vice President and Group Director, IC Design (Analog) (departed on 8 April 2015)

高級行政人員

截至2016年3月31日，高級行政人員包括：

總部行政人員

湯復基博士，行政總裁

楊美基博士，首席科技總監

廖家俊博士，首席市場總監（於2016年1月6日離任）

梁穎莊女士，首席行政總監

容慧琪女士，首席財務總監

鄺國權先生，行政總裁高級顧問（於2015年9月18日離任）

科技部門主管

莊哲義博士，通訊技術部副總裁及技術部總監兼軟件與系統技術部署理總監

李耀基先生，集成電路設計（數碼）技術部總監

劉遠昭博士，軟件與系統技術部總監（於2015年9月14日離任）

史訓清博士，電子元件技術部總監

王世松博士，信息安全與數據科學技術部總監

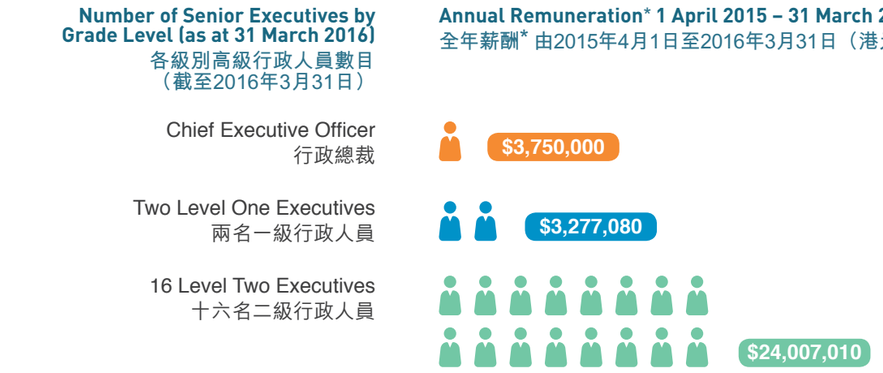
吳恩柏博士，光電子技術部副總裁及技術部總監（於2015年7月11日離任）

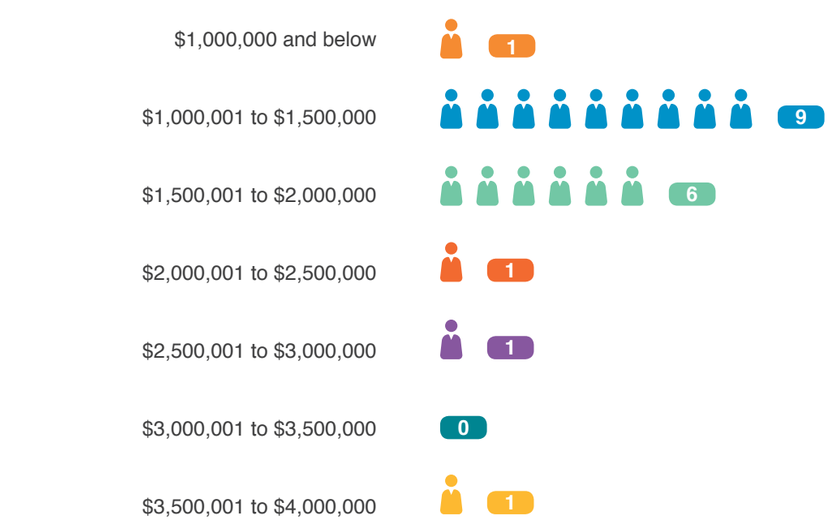
張為民先生，集成電路設計（類比）技術部總監

王克中博士，集成電路設計（類比）技術部副總裁及研發群組總監（於2015年4月8日離任）

Annual Remuneration of Senior Executives

高級行政人員薪酬





* Annual remunerations of the two senior executives who joined in the course of the financial year were calculated on a prorated basis.
在財政年度中加入應科院的兩名高級行政人員，其全年薪酬按比例計算。

Management Structure

ASTRI is headed by a Chief Executive Officer (CEO) who is responsible to the Board of Directors for the overall management of the Institute. The CEO is assisted by the Technology Division Heads as well as senior executives responsible for administrative, financial, commercial and other support functions.

To scale up our research capabilities and initiatives, we have strengthened our management structure to provide more room for growth and promote technology development. The management structure as at 31 March 2016 is:

管理層架構

應科院由行政總裁領導，並向董事局負責公司的整體管理。行政總裁旗下有科技部主管及高級行政人員，負責行政管理、財務、商務及其他支援的職責。

為了提升研發能力及擴闊研究的規模，我們優化管理架構以提供更多發展空間及提升技術拓展。下圖為截至2016年3月31日應科院的管理架構：

Technology Divisions 科技部

IC Design (Analog) 集成電路設計 (類比)
IC Design (Digital) 集成電路設計 (數碼)
Opto-electronics 光電子
Electronics Components 電子元件
Software & Systems 軟件與系統
Security & Data Sciences 信息安全與數據科學
Communications Technologies 通訊技術

Core Competence Groups 研發組

RFIC Design 射頻晶片
Memory 存儲器
Sensors 傳感器
Packaging 構裝
Multimedia Systems & Analytics 移動計算與系統
Cybersecurity 網絡安全
Baseband Solutions 基帶解決方案
Low Power Design 低功耗設計
Video 視頻
Modules & Integration 模組與集成
Li Battery 鋰電池
Cyber-Physical Systems 網宇實體系統
Data Analytics 大數據分析
Networking Software 網絡軟件
Design Technology 設計技術
Communications 通訊
Manufacturing Technologies 製造技術
Mobile and IoT Platforms 嵌入式系統
Cloud Computing 雲端計算
Emerging Systems 新興系統
ASIC Implementation ASIC 實現
MEMs 多媒體處理
Video Analytics 視頻分析

A Professional Team

ASTRI draws its strengths from its people. Over 80% of ASTRI's workforce is in R&D, with expertise and experience covering a broad range of technological areas.

Headcount Status

The following is a breakdown of the staff members under the respective Technology Divisions and teams as at 31 March 2016:

專業團隊

人才是應科院得以拓展的關鍵因素。而應科院整體員工中，佔八成為研發人員，他們具備科研專才和經驗，肩負不同領域的科研工作。

員工人數

以下是截至2016年3月31日有關員工所屬團隊的統計資料：

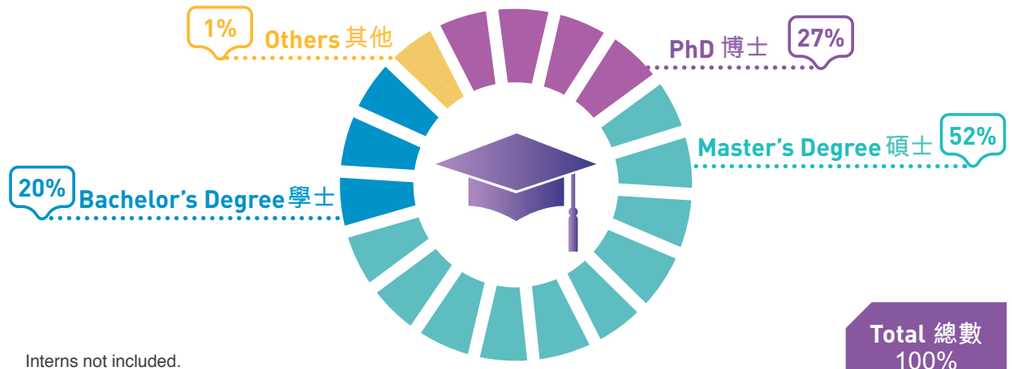
Team / Technology Division (as at 31 March 2016)
小組 / 科技部 （截至2016年3月31日）

Headquarters 總部	Communications Technologies 通訊技術	Electronics Components 電子元件	IC Design (Analog) 集成電路設計 (類比)	IC Design (Digital) 集成電路設計 (數碼)
82	68	35	51	50

Opto-electronics 光電子	Security and Data Sciences 信息安全與數據科學	Software and Systems 軟件與系統	Others 其他	Interns 實習研究員
50	85	43	18	17

Total 總數 499

Academic Qualifications of R&D Personnel 研發人員學歷



Total 總數 100%

Interns not included.
不包括實習研究員

Awards and Achievements

獎項與殊榮

ASTRI's Small Cell Technology Applauded by the Industry

Our technology enabled our partner, Fujian Sunnada Communication, to commercialise the small cell reference design. Sunnada was the first successful candidate of China Mobile 2015 integrated pico station centralised procurement project.

應科院小基站技術備受業界讚賞

應科院為其合作夥伴福建三元達通訊股份有限公司提供小基站技術方案，使其小基站參考設計商業化。三元達成為中國移動2015年一體化皮基站集中採購項目的第一中標候選人。

ASTRI's small cell technology
應科院小基站技術

The first successful candidate: Fujian Sunnada Communication
第一中標候選人：福建三元達通訊股份有限公司

Finalist of Best Car Accessory in Consumer Electronics Show (CES) Asia 2015

ASTRI showcased and demonstrated the Head-up Display in the CES Asia 2015 and was nominated the 'Finalist of Best Car Accessory of CES Asia 2015'.

2015亞洲消費電子展最佳汽車配件提名

應科院於2015亞洲消費電子展中，展示和示範智能抬頭顯示器，並獲提名「2015亞洲消費電子展最佳汽車配件」。

ASTRI's Head-up Display for automotive
應科院車載抬頭顯示器

Finalist of Best Car Accessory in Consumer Electronics Show (CES) Asia 2015
榮獲2015亞洲消費電子展最佳汽車配件提名

The 'Real Time Location Proximity Data System for Smart Cities' R&D team
「智慧城市的實時定位感應數據系統」研發團隊

First Runner-up in HKIE Electronics Division Project Competition 2016 (HKEPC2016)

ASTRI's technology project 'Real Time Location Proximity Data System for Smart Cities' won the First Runner-up in the Industry Category at the Hong Kong Institution of Engineers (HKIE) Electronics Division Project Competition 2016 (HKEPC 2016).

2016 香港工程師學會電子分部項目比賽亞軍

應科院的技術項目「適用於智慧城市的實時定位感應數據系統」在2016香港工程師學會電子分部項目比賽工業組中勇奪亞軍。

Dr Vincent Lau (middle), Director of Software and Systems of ASTRI honoured by HKCS
應科院軟件與系統總監劉文建博士榮獲2015香港電腦學會傑出資訊及通訊科技人員獎

ASTRI's R&D Expert Honoured by the Hong Kong Computer Society

Dr Vincent Lau, Director of Software and Systems of ASTRI, received the Hong Kong Computer Society (HKCS) Outstanding ICT Achiever Award 2015 in the Consulting Category at the HKCS 45th Anniversary Gala Dinner on 25 November 2015.

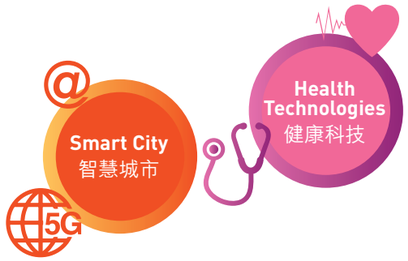
應科院科研領袖榮獲2015香港電腦學會傑出資訊及通訊科技人員獎

應科院軟件與系統總監劉文建博士在2015年11月25日舉行的香港電腦學會45週年晚宴上，獲頒發香港電腦學會舉辦的「2015傑出資訊及通訊科技人員獎（顧問組別）」。

R&D Direction and Strategies

In 2014-15, ASTRI conducted a comprehensive review of its capabilities, priorities and social commitments. As a result, its organisation structure was streamlined to optimise output and efficiency. That led to the formulation of a five-pillar R&D strategy. This year we want to build on our existing research strengths and leverage the groundwork already laid. The five strategic pillars, coupled with our 'Research Centre', will lead to better alignment and synergy in our R&D efforts.

The Five Pillars of ASTRI's R&D Strategy



We have carefully identified and organised our niche and core capabilities in around 20 groups under the seven technology divisions, covering a wide range of areas from IC design, optical and electronic components, 3D and high-power electronics packaging, embedded and cloud-based software development, to wireless communication technologies, cybersecurity and smart gadgets. The five strategic focus areas, along with the 'Research Centre', form our '5+1' strategic impetus. They will ensure optimal utilisation of ASTRI's R&D strengths, and lead to a more prolific and dynamic future for us.

The 'Research Centre' is the Hong Kong branch under the Chinese National Engineering Research Centre for Application Specific Integrated Circuit System (CNERC). The main centre is located at Southeast University in Nanjing, and CNERC is the first of its kind set up in Hong Kong. We are very honoured to have been given the approval by the State Ministry of Science and Technology in 2012 to establish this important research centre. This platform will better equip ASTRI to explore a wider arena of technological excellence, and to make better contributions at the national level.

Our '5+1' strategy forms a strong grid for ASTRI's R&D focus and direction. This, we are confident, will set the cornerstone for ASTRI's R&D endeavours in the years to come. ASTRI remains committed to playing its part in advancing scientific and technological developments for Hong Kong and our nation, and also for the world.

研發方向及策略

在2014-15年度，應科院就其優勢、首要任務及對社會的承擔進行全面檢討。隨後，應科院精簡公司架構以優化成果及效率，並制定出五大支柱的研發策略。今年（2015-16），我們更進一步，以增強和鞏固研究優勢，並在之前已奠下的基礎上，規劃出五個研究範疇及一個研究中心（簡稱5+1策略），使本院的研發策略和項目相一致，從而產生協同效應。

應科院五大支柱的研發策略

應科院在其轄下之七大科技部門的二十餘研發小組中，已仔細釐定切合應科院之研發策略及其核心能力的項目，其中涵蓋的範疇相當廣泛，包括集成電路設計、光學與電子元件、三維（3D）及高效電子封裝、嵌入式和雲端軟件開發、無線通訊科技、網絡安全及智能工具等。5+1策略乃應科院向前推進的動力，5+1研發方向亦有助應科院充分利用其研發的實力，令香港邁向更豐盛多元的未來。

應科院很榮幸在2012年獲得國家科學技術部批准成立國家專用集成電路系統工程技術研究中心香港分中心，這是香港首家獲國家科技部批許的研究中心，其主中心則位於南京的東南大學內。應科院希望透過這平台開拓更廣泛而尖端的科技，為國家作出貢獻。

5+1策略亦為研發重點和方向形成一個強大的格局。我們有信心應科院在未來幾年將以此為基石，全力以赴發展前瞻科研項目，為香港、國家以至世界的科技發展作出貢獻。

Performance

As a publicly-funded applied technology research institute, ASTRI is committed to maximising 'public good'. The measures of our success are economic impact and other benefits brought to the industries and the community. To generate economic impact, ASTRI vigorously focuses on customer needs and commercialisation of its technologies.

A vitally important part of ASTRI's customer-focused R&D practices is the rigorous setting and monitoring of quantitative performance targets.

Quantitative Performance Targets

ASTRI has three major quantitative performance targets:

Number of technologies transferred to industry per year

每年轉移至業界的技術數目

This is a very crucial target as technology transfer leads to the actual commercialisation of ASTRI's intellectual properties for the benefit of different industries.
由於技術轉移有助應科院把研發項目之知識產權轉移至業界應用，所以技術轉移的數目是一個相當重要的目標。

Number of patent applications filed and granted

每年申請和取得的專利數目

This is important because patent is an essential indicator of the real value of innovations and is being used to maximise the benefits of technology transfers.
專利是評估所研發的技術是否有價值的主要指標，同時，亦有助提升技術轉移所獲得的好處，因此十分重要。

Annual income from industry

每年從業界所得的收入

As ASTRI continues to engage with customers and build a valuable brand name for its customer base, the eventual income from this base, through services such as licensing and technology sales, design and product development, will increase.
應科院致力服務業界，並在客戶心目中建立有價值的品牌，透過各種服務、如技術授權、技術轉售、設計及產品開發等，從業界所得的最終收入將會增加。

ASTRI has delivered against each of these targets with promising results, thereby making strong and sustainable progress during the year.

業績

作為一所政府資助的應用科技研發機構，應科院堅守一個信念，就是以達致最大的「公眾利益」為目標，而公眾利益是以應科院帶給業界和整體社會的經濟效益和其他得益來衡量。為了創造更大的經濟效益，應科院過去一直全力以赴，以迎合業界需求和將技術市場化作為工作重點。

應科院為其業績設立嚴謹而可量化的目標，成為其以客戶為導向的研發工作中重要的一環。

可量化工作目標

應科院設立了三個可量化工作目標：

年度內，應科院在各個工作目標都表現理想，令應科院的項目持續並穩健地推展。

Planning and Monitoring

ASTRI strives to maximise the impact of its R&D work on customers by translating research into actual results. Customer focus is the core guiding principle behind every aspect and element of our R&D programmes, from initiating ideas to transferring intellectual properties to customers. We also focus on ensuring the quality of both our research and management processes.

The Annual Planning Cycle, comprising three steps, is in place to ensure the quality of our R&D programmes. The three steps are:

1. Annual update of the technology roadmap in December for review by the Board's Technology Committee
每年十二月更新應科院的科技發展藍圖，並由應科院董事局的科技委員會審閱

2. Review of the overall strategies and their implementation regularly by the Technology Committee
科技委員會定期檢討應科院的整體策略及其執行情況

3. Review and approval by the Board of Directors
由董事局審閱及批核

策劃與監察

應科院透過把研究的成果轉化為實際的應用，致力以科研的成效令客戶獲得最大的效益。在各研發項目的每個環節和元素，由項目的意念開展到將所研發的知識產權轉移至客戶，應科院均把客戶的需要放在大前提。應科院對確保研究和管理過程的質素也非常重視。

為了確保研發項目的質素，我們每年均會作出規劃，當中包括下列三個步驟：

In addition to the three-step process, the Technology Committee selects and reviews on-going R&D projects within six to nine months after their commencment to evaluate the effectiveness of customer engagement.

In addition, ASTRI has to submit a report every six months to the Innovation and Technology Commission to track the progress against preset milestones. Our senior management, on the other hand, conducts monthly monitoring of every project that is in progess.

To improve patent quality, increase financial returns and gauge success of our R&D work, we adopt a balanced measure that takes into account the number of patent applications filed and granted, as well as the income generated from patent licensing.

Four Main Types of Research Projects

Our research projects fall under four categories:

ITF-funded Platform Projects
創新及科技基金資助平台項目

Projects that are mainly funded by ITC with industry contribution of at least 10 % of the total project costs. ASTRI owns all IP rights but industry partners can license the IP non-exclusively.
項目主要由創新科技署資助，業界投入至少佔總成本10%的資金。應科院擁有所有知識產權，但業界夥伴可以非獨家特許授權知識產權。

Industry Collaborative Projects
業界合作項目

Both ASTRI and partners contribute fund and other resources.
應科院及合作夥伴雙方均投入基金和其他資源。

For industry contribution:
業界投資：

- Over 超過 **30%** — Industry partners can exclusively license the foreground IP for a period
業界夥伴可獨家特許授權其後開發的知識產權一段時間
- Over 超過 **50%** — Industry partners can own the foreground IP
業界夥伴可擁有其後開發的知識產權

研發項目主要分四大類

我們的研究項目分為四大類型：

ITF-funded Seed Projects
創新及科技基金資助種子項目

Projects that are forward-looking or exploratory work, providing foundation work for future projects.
前瞻性和探索性質的研發項目，為將來的項目奠下基礎。

Contract Research Projects
合約研究項目

Partners are responsible for 100% of R&D project costs. The R&D projects are customised according to industry partners' requests. Industry partners can own the foreground IP.
業界夥伴須負責全部研發成本，研究項目會按業界夥伴個別需要而制定。業界夥伴則可擁有其後開發的知識產權。

除了採取這些步驟外，董事局科技委員會於這些項目開始後的六至九個月內進行抽核，以評估其獲取客戶支持的成效。

此外，應科院須要每半年向創新科技署提交進度報告，以便於查考進展以及達標程度。而管理層會監察各項目每月的進度。

為了提升專利質素以增加收入和評估研發成效，應科院採用多個合理指標，其中包括申請專利數目，成功獲批專利數目及專利授權收入等。

Technology Transfers

During the year, 53 technology transfers to industry were recorded.

Number of Technology Transfers by Technology Divisions*

技術轉移

應科院在本年度內向業界作出共53項技術轉移。

各科技部向業界轉移技術的數量*

Technology Division 科技部	2015-16
Communications Technologies 通訊技術	8
Electronics Components 電子元件	6
IC Design (Analog) 集成電路設計（類比）	7
IC Design (Digital) 集成電路設計（數碼）	4
Opto-electronics 光電子	5
Security and Data Sciences 信息安全與數據科學	16
Software and Systems 軟件與系統	7
Total 總數	53

* Only 2015-16 figures are included because previous figures are categorised according to technology domains
只包含2015-16年度的數字，之前的數字則按科技範疇分類

The following table illustrates the number of technology transfers to industry by various channels over the past three years.

Number of Technology Transfers to Industry by Various Channels

下表列出過去三年應科院通過各種途徑向業界轉移技術的數量。

向業界轉移技術的途徑及數量

Contract Type 合約類型	2015-16	2014-15	2013-14
Industry Collaborative Projects 業界合作項目	5	2	3
Contract Research Projects 合約研究項目	31	46	60
Licensing Agreements* 授權合約*	17	32	24
Patent Assignments 專利轉讓	0	0	1
Total 總數	53	80	88

The following table shows the three major types of projects undertaken by ASTRI over the past three years. The number of new projects in 2015-16 was 42.

Number of Projects Undertaken

下表展示過去三年應科院進行的四類主要研發項目的數量，2015-16年展開的新項目共42項。

應科院進行的研發項目數量

Project Type 項目種類	2015-16	2014-15	2013-14
ITF-funded Platform Projects 創新及科技基金資助平台項目	49	53	53
ITF-funded Seed Projects 創新及科技基金資助種子項目	37	21	22
Industry Collaborative Projects 業界合作項目	9	7	7
Public Sector Trial Scheme Projects 公營機構試用計劃項目	8	7	2
Total 總數	103	88	84

* Certain licensing agreements consist of contract services provided by ASTRI
部分授權合約包含應科院提供的合約服務

ASTRI patents
應科院獲得的專利

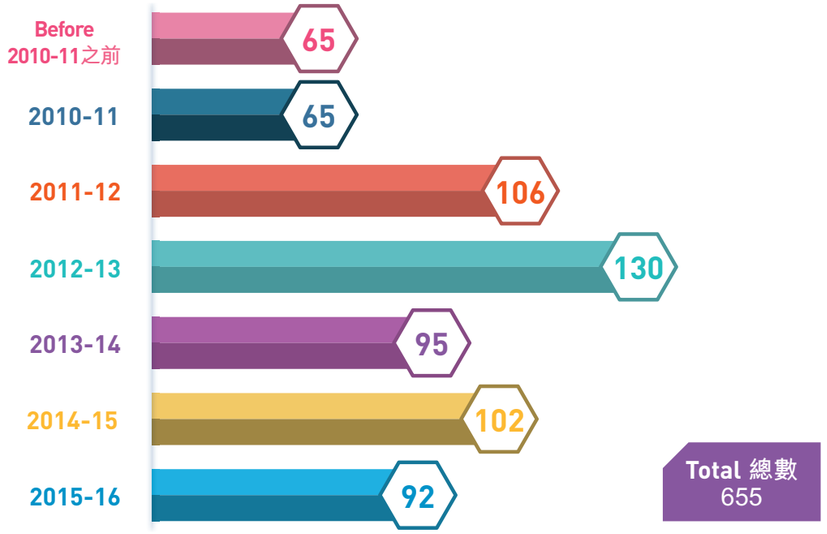
Patents

A total of 92 new patents were granted to ASTRI during the year, taking the total accumulated number of patents to 655 as at 31 March 2016. The following chart shows the growth trend in previous years, including patents granted in the U.S., the Mainland, and other countries.

專利

應科院本年度共獲發92項專利，截至2016年3月31日止，應科院累積專利共655項。下圖展示應科院過去數年從美國、內地及其他國家取得專利的數目。

Number of Patents Granted
獲得專利數目



A total of 56 patent applications were filed in the Mainland, the U.S. and other countries during the year. The number of applications filed by Technology Divisions in the past three years is tabulated below.

本年度應科院在內地、美國及其他國家共提交56項專利申請。下表列出過去三年各科技部申請的專利數目。

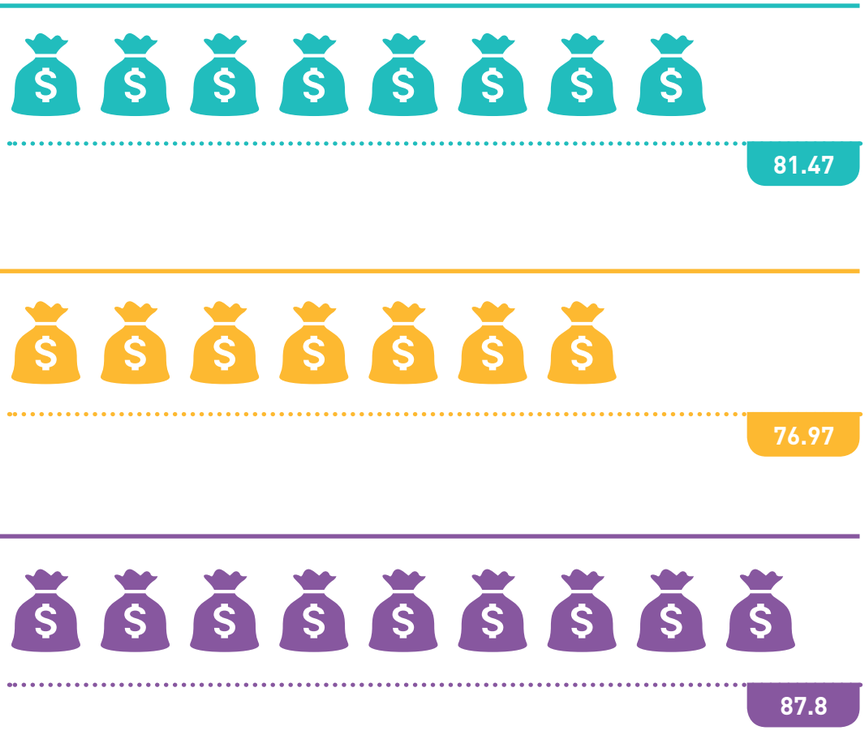
Number of Patent Applications Filed by Technology Divisions
各科技部申請的專利數目

Technology Division 科技部	2015-16	2014-15	2013-14
Communications Technologies 通訊技術	15	9	5
Electronics Components 電子元件	8	6	16
IC Design (Analog) 集成電路設計（類比）	15	12	3
IC Design (Digital) 集成電路設計（數碼）	0	1	3
Opto-electronics 光電子	12	15	30
Security and Data Sciences 信息安全與數據科學	4	3	9
Software and Systems 軟件與系統	2	4	6
Total 總數	56	50	72

Income from Industry

Income received* from industry for all projects amounted to HK$81.47 million. The level of industry contribution is 21.7 per cent. The table below shows the income received from industry in the past three years.

Income from Industry (HK$M)



* Including cash and in-kind contribution
包括現金及物資資助

業界收入

本年度應科院從所有項目取得的業界收入*總額為8,147萬港元，業界贊助水平亦達至21.7%。下圖顯示過去三年從業界所得收入總額。

已收取的業界收入（百萬港元）

Income received* from the industries by various Technology Divisions in the 2015-16 financial year is tabulated below.

Income Received* from industry

Technology Division / Others 科技部 / 其他	2015-16 (HK$M)
Communications Technologies 通訊技術	16.61
Electronics Components 電子元件	8.14
IC Design (Analog) 集成電路設計（類比）	12.31
IC Design (Digital) 集成電路設計（數碼）	12.24
Opto-electronics 光電子	13.88
Security and Data Sciences 信息安全與數據科學	9.72
Software and Systems 軟件與系統	8.30
Headquarters 總部	0.23
General Support Programme 一般支援計劃	0.04
Total 總數	81.47

* Including cash and in-kind contribution
[Note: Only 2015-16 figures are included because previous figures are categorised according to technology domains]
包括現金及物資資助
（註：只包含2015-16年度的數字，之前的數字則按科技範疇分類）

下表列出2015-16財政年度各科技部所獲得的業界收入*。

已收取的業界收入*

Impactful Collaborations and Commercialisation

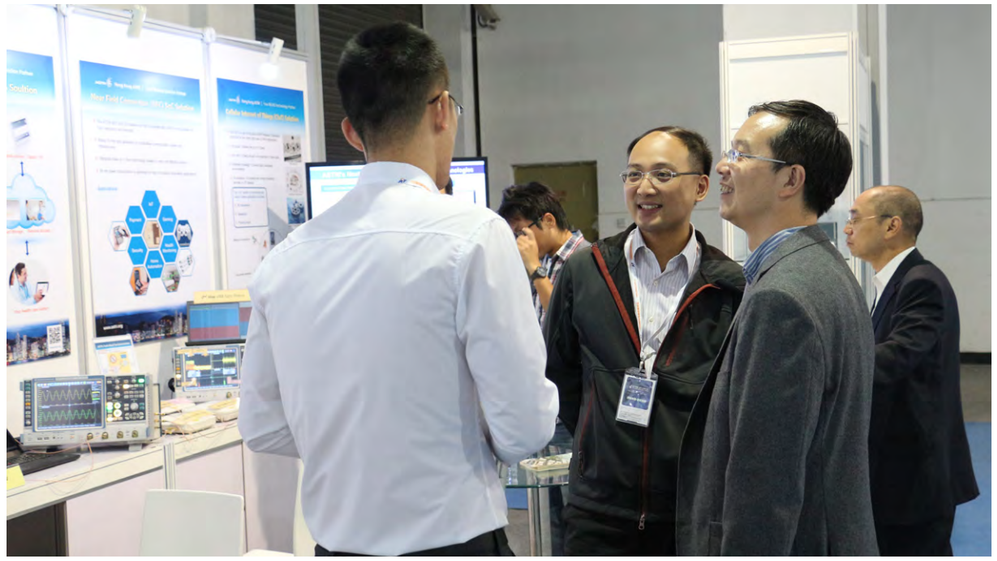
Throughout the review year, ASTRI signed 53 agreements for technology transfers to the industry through licensing, contract research and other means, leading to many fruitful collaborations and commercialisation.

Communications Technologies

ASTRI's LTE/LTE-A small cell and micro cell baseband reference design was licensed to a number of organisations including Sunnada, Hebei Far-east Communication, Sunwave and Innofidei. The design ranked first in China Mobile's 2015 small cell tendering.

In leading international telecom exhibitions, we showcased commercial-grade mobile core network solutions such as Virtual Evolved Packet Core (EPC), LTE baseband solutions like C-RAN, and Machine-Type Communications (MTC) user terminals. The exhibitions included Mobile World Congress Barcelona, Mobile World Congress Shanghai and PT/EXPO China - with Sunnada, Keysight, and Rohde & Schwarz among our partners.

Microcell base station reference design
微基站基帶參考設計



Mobile World Congress Barcelona 2016
2016年世界移動通訊大會 - 巴塞隆納

具影響力的合作和技術市場化

在過去一個年度內，應科院共簽訂了53項協議，通過授權、合約研究等方式，將技術轉移至業界，造就許多具超卓成果的合作和市場化進程。

通訊技術

應科院的LTE/LTE-A小基站和微基站基帶參考設計已經授權給多間客戶，包括福建三元達、河北遠東通訊、三維通訊和創毅視訊。福建三元達憑藉應科院的小基站技術方案，在中國移動於2015年小基站集中採購項目招標中位列榜首。

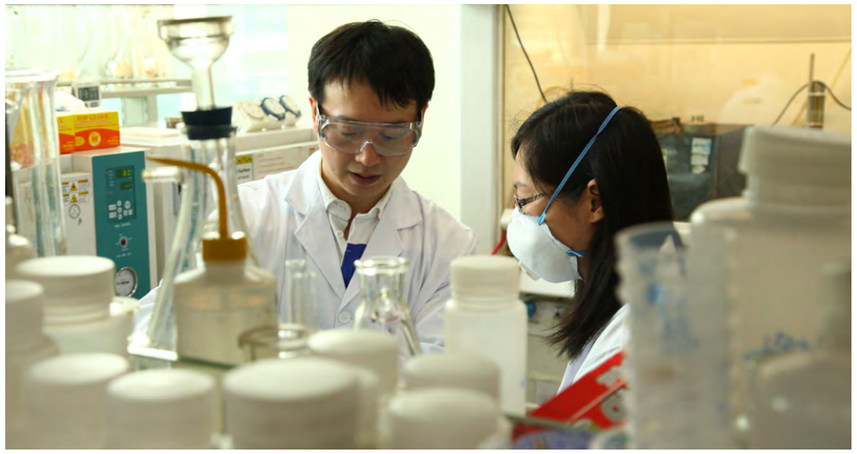
應科院在過去一年與福建三元達、是德科技、羅德與施瓦茨、合勤科技等公司攜手合作，在電訊業內頂尖的展覽會，如巴塞隆納世界移動通訊大會、上海世界移動通訊大會和北京中國國際信息通信展覽會中，演示應科院最新技術，包括：商用級移動核心網方案，如虛擬核心網 絡，及集中化無線接入網絡（C-RAN）和機器類型通訊（MTC）等LTE基站方案。

Electronics Components

ASTRI supported China Advanced Semiconductor Innovation Alliance (CASA) and Chinese Institute of Electronics (CIE) for IEEE International Technology Roadmap for Wide Band-gap Power Semiconductor (ITRW), and International Technology Roadmap for Semiconductors (ITRS) preparation respectively. ASTRI aims to promote cross-border cooperation between universities, research centres and industry to create a healthy industry ecosystem. The events presented great opportunity for us to extend our technology developments to international markets and to promote global advanced semiconductor materials and products commercialisation.

In the past year, ASTRI transferred its technologies and products to several customers for mass production and deployment. Some of the highlights are:

- China's first material recipes for electrodeposition to Shanghai Sinyang Semiconductor Materials Co., Ltd. / AKM Electronics Industrial (Panyu) Ltd.
- China's first dual MEMS Tire Pressure Monitoring Systems (TPMS) to No. 38 Research Institute of CETC / Chery Automobile / JAC Motors
- Radio Frequency Identification (RFID) reader to Tianjin Port Development Holdings Limited
- 3D power module to Great Team Backend Foundry (Dongguan) Ltd. / STMicroelectronics



Electronics Components laboratory
電子元件實驗室

電子元件

應科院分別支援第三代半導體產業技術創新戰略聯盟及中國電子學會，以申請國際電機電子工程協會的國際寬禁帶功率半導體技術路線圖及國際半導體技術路線圖。其目的主要是促進產學研以及跨境應用合作，建立健全的產業生態系統，以擴展我們的技術發展，開拓國際市場，實現第三代半導體材料與產品的產業化。

在2015-16年，應科院成功轉移其技術及產品給數家客戶作大量生產和應用，詳情如下:

- 授予上海新陽半導體材料股份有限公司/安捷利（番禺）電子實業有限公司的中國第一份用於電沉積的材料配方
- 授予中國電子科技集團公司第三十八研究所/奇瑞汽車/江淮汽車的中國第一個雙模運作的微機電系統輪胎壓力監測系統
- 授予天津港發展控股有限公司的無線射頻識別讀寫器
- 授予杰群電子科技（東莞）有限公司/意法半導體有限公司的3D功率模組

Miniaturised Dual-frequency RFID Reader (MDR) w/ NFC Functions for Smartphone

The technologies and products of miniaturised dual-frequency RFID reader, including package structure SiP design, software development, sample building and testing, were developed and shared with four companies in Hong Kong and the Mainland, resulting in about HK$3 million of industry contribution. These solutions were also introduced to a number of companies for business collaboration.

Lithium Rich Cathode Material (LRCM) for High Energy Density Advanced LIB

The technologies and products of lithium rich cathode material, including cathode materials and process recipes, as well as material characterisation and analysis, were developed and provided to two companies in Hong Kong, resulting in over HK$1 million of industry contribution. The high capacity lithium rich cathode materials were successfully scaled up and prepared for mass production on the customer's site. The LRCM can achieve a capacity of 200 mAh/g; and the 18650 battery with our LRCM and customised anode, which are of commercial standards, can achieve an impressive capacity of 2,600 mAh on average. The battery samples were tested in China BAK Battery Inc. All these were introduced to many other companies through business collaboration.

應用於智能手機兼具有近場通訊（NFC）功能的小型化雙頻RFID讀寫器

應科院把有關微型化雙頻RFID讀寫器所開發的技術及產品，包括小型化系統級封裝（SiP）設計、軟件開發、樣品製作及測試，成功向四間香港及內地的企業作產品開發及技術轉移，從業界所得收入高達港幣300萬元。部門已將這些技術和產品向其他企業推廣，務求發掘更多合作商機。

先進高能量密度鋰離子電池富鋰正極材料

應科院把有關富鋰正極材料所開發的技術及產品，包括正極材料及製造配方，和材料特性及分析，成功向兩間香港的企業作產品開發及技術轉移，從業界所得收入超過港幣100萬元。而所開發的富鋰正極材料亦已成功通過了客戶廠房的實地測試，因此可進行大量生產。此富鋰正極材料的克容量可達200mAh/g，富鋰正極和高容量負極組裝成符合商業標準的18650電池，其平均容量達2,600mAh，電池樣品通過中國比克電池股份公司測試。應科院已將這些技術和產品向其他企業推廣，務求發掘更多合作商機。

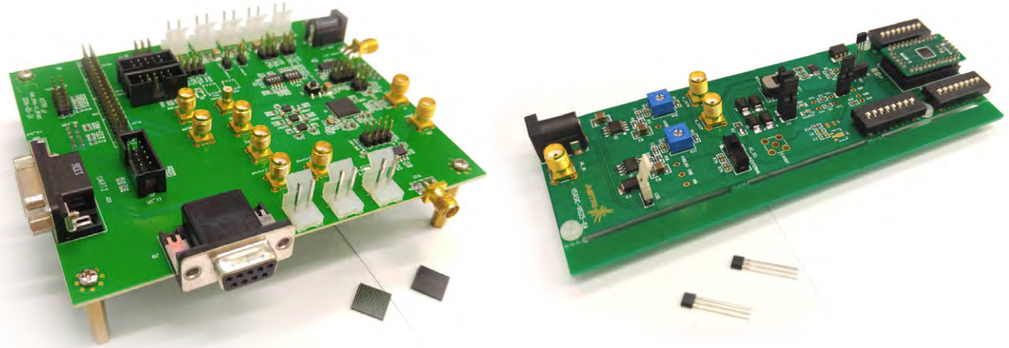
Lithium rich cathode materials and lithium-ion battery prototypes
富鋰正極材料及鋰離子電池樣品

IC Design (Analog)

ASTRI has successfully transferred several low-power analog-to-digital converter, wireless RF transceiver and baseband IPs to a wide range of applications. These high performance RF, analog and mixed-signal integrated circuit Intellectual Properties (IPs) made it possible for customers to improve their productivity while maintaining sustainable competitive advantages.

集成電路設計（類比）

應科院已經成功地把一系列的低功耗類比數字轉換器、無線收發器和基帶技術的知識產權轉移給業界，以應用到廣泛的領域。這些高性能的射頻、類比和混合訊號集成電路技術，讓我們的客戶可在短時間內提升生產力，並建立可持續的競爭優勢。



Bluetooth Low Energy (BLE) ASIC and test board
低功耗藍牙芯片及測試板

Hall sensor IC and test board
霍爾傳感器芯片及測試板

- A group of analog and mixed-signal integrated circuit design was licensed to a Hong Kong start-up which integrated them into its ultra low-power wireless transceiver ASIC for mass production. Over 650,000 IC units were shipped out soon after mass production. A group of analog front-end IPs was licensed to another Hong Kong start-up company for mass production of sensor System-on-Chip. Sales volume of the company picked up substantially, with 3.3 million units of the product shipped to its customers.

- Hall sensor ASIC is a critical part of the brushless direct current (DC) motor controllor, which offers many advantages such as being noise-free, maintenance-free, low cost, highly reliable and high performance. It comes in a compact size with durable lifetime. The brushless DC motor operates with high efficiency, and is able to contribute significantly to energy saving and environmental protection. ASTRI has worked with a leading motor company on innovative Hall sensor ASIC design. Embedded with Hall sensor ASIC, the module is now a quarter of the size of the company's

- 應科院把一組類比及混合訊號的集成電路設計授權給香港的一家初創企業，整合至他們的超低功耗無線收發器芯片上，並於去年投入量產並付運了超過65萬顆芯片。另一類比前端集成電路設計也授權給香港的一家初創企業，應用於傳感器單芯片上並已量產，去年的銷售量大幅增長到330萬顆。

- 霍爾傳感器芯片是無刷式直流馬達控制器的重要部分，其主要優勢包括：無噪聲、免維護、低成本、高穩定性、高性能、尺寸小巧和壽命長等。無刷式直流馬達運行效率高，在節能和環境保護方面作出了很大貢獻。應科院已經與一家無刷式直流馬達龍頭企業合作，設計創新的霍爾傳感器芯片。嵌入這項霍爾傳感器芯片的模塊，尺寸小巧，是現有產品的四分之一。應科院在短期內克服了重重難關，例如設備和流程設計、微弱訊號處理及噪聲消除等。憑著切合實際

existing product's. We overcame a series of difficulties, including device and process design, weak signal processing and noise cancellation, within a short period. With solid design methodologies, we have developed ASIC with the first sample tapeout success. The partner company is preparing for mass production of the device. Hall sensor ASIC is expected to generate great impact to the existing motor controller market.

- Multi-million-dollar non-exclusive licensing agreements were signed with two cabless IC design companies for BLE technology, with BLE RF transceiver, baseband and analog, and mixed-signal IP covered in the collaborations.

IC Design (Digital)

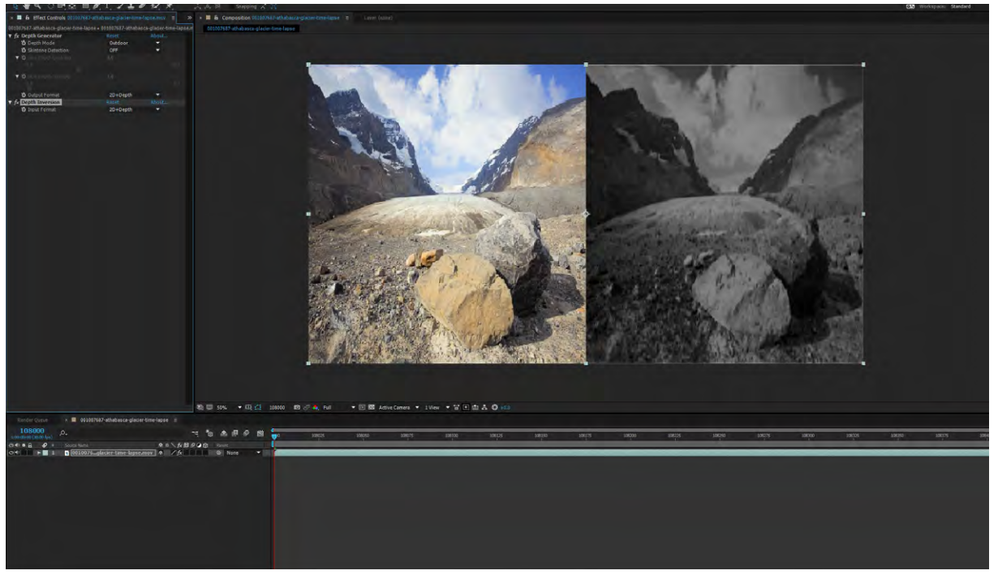
ASTRI has been developing the 3D conversion and resolution, as well as image enhancing technologies for several years, with many platform projects also underway. These projects aim for hardware or hardware-software hybrid platforms with the implementation of ASTRI's self-developed image processing algorithms for 3D conversion and resolution and image enhancing technologies.

的設計方法與豐富的經驗，應科院開發了這款芯片，並在第一次流片驗證上取得了成功。合作公司正準備將此投入量產，這項霍爾傳感器芯片將對現有的馬達控制器市場帶來重大的影響。

- 集成電路設計（類比）科技部已與兩家無線半導體設計公司簽署了價值數百萬元的協議，把藍牙低功耗技術，涉及藍牙低功耗收發器、基帶和類比及混合訊號集成電路設計以非獨家方式授權予該兩家公司。

集成電路設計（數碼）

近年，應科院一直致力開發3D轉換和解像度及圖像增強技術，現時有若干平台項目涉及這些領域。這些項目主要集中於設計硬件或軟硬件混合平台，配合採用應科院研發的3D轉換和解像度及圖像增強技術的圖像處理系統。



ASTRI's 3D conversion and resolutuon, as well as image enhancing technologies
應科院的3D轉換和解像度及圖像增強技術

In 2015-16, these technologies were successfully applied in many of our customers' spectacles-free 3D products such as 3D Video Wall, 3D Phone, 3D Tablet and Ultra High Definition 4K 3D Digital Signage Display.

ASTRI has also been developing the advanced SoC technology for many years. In the past year, we had an opportunity to engage a new SoC application on satellite navigation. The target application is to support both GPS and China Beidou navigation standards.

Opto-electronics

Manufacturing Technologies

- A HK$10 million contract service agreement was signed with a tier-one manufacturing company for the development of display panel dead pixel inspection system and mechanical part appearance defects inspection system. ASTRI's development outputs were well-received by the customer and were fully implemented at the customer's factory sites in the Mainland for field testing in Q1/2016.

- 'ASTRI – TRULY Joint Research and Development Centre' was set up in 2015 for enhancing professionalisation and fostering commercialisation of new technologies. The parties set up the state-of-the-art LCoS (Liquid Crystal on Silicon) Display Technology Joint Laboratory to develop Head-up Display (HUD) parts and related technologies. Several licensing and contract service agreements worth over HK$3 million were signed.

在2015-16年度，這些技術已成功應用於客戶多種裸眼3D產品中，如3D拼接屏、3D電話、3D平板電腦及超高清4K3D數碼廣告牌顯示器。

應科院多年來一直開發先進的系統晶片（SoC）技術，我們在2015-16年度有機會參與新的衛星導航SoC應用，這項技術可同時支援GPS和中國北斗導航標準。

光電子

製造技術

- 我們與一家一線生產商簽訂1,000萬港元的合約服務協議，開發液晶面板壞點檢測系統和機械部件外觀瑕疵檢測系統。應科院的技術方案得到客戶的完全認可，並已在2016年第一季於客戶位於內地的工廠點進行現場試驗。

- 「香港應科院－信利聯合研發中心」於2015年成立，旨在加強科研技術的專業化、市場化和產業化。雙方成立先進LCoS顯示技術聯合實驗室，共同進行車載抬頭顯示器核心顯示部件和技術的研究。應科院已成功簽訂數個授權協議和服務協議合同，價值超過300萬港元。

Cover Glass and Touch Panel Glass Automatic Defects Inspection System
玻璃及觸控面板玻璃自動瑕疵檢測系統

- A Licensing and Contract Service Hybrid Agreement of over HK$1.8 million was signed with a manufacturing company for developing multiple layers transparent surface visual inspection technologies. The Manufacturing Technologies Group completed the design of One Glass Solution (OGS) touch panel glass defect inspection system, which was implemented on the customer's factory sites on the Mainland for field testing.

Modules and Integration

- The cardiovascular monitoring technology was licensed to several tier-one healthcare manufacturers in Hong Kong and the Mainland for product commercialisation. Also, the non-invasive blood glucose measurement technology was licensed to a number of healthcare manufacturers in Hong Kong and the Mainland.

- In August 2015, one of the licensees signed an extension of the licensing of the cardiovascular monitoring device, which amounted to around HK$0.8 million.

- The technology transfer of cardiovascular monitoring device to a Hong Kong medical device manufacturer was completed. The licensee's product is expected to be launched in Q1-2017.

Security and Data Sciences

ASTRI has forged close collaborations with Hong Kong Monetary Authority (HKMA), financial institutions, and Financial Technology (FinTech) companies including many start-ups on developing advanced FinTech. The newly established ASTRI Security Lab (ASL) has been working with HKMA, Hong Kong Police Force, and major banks such as HSBC and Bank of China (Hong Kong) on various cybersecurity research, training, and intelligence sharing systems. ASL has also been working with different financial institutions as well as FinTech firms on research-based cybersecurity vulnerability studies, cloud security system development, and big data analytics products and systems.

We have been working with the industries and the universities to nurture future talents for the FinTech industry. These initiatives include establishing research and teaching collaboration platforms with local universities such as The University of Hong Kong to facilitate teachers and students to work with our researchers on FinTech projects, devising an incubation programme to train young entrepreneurs, and conducting FinTech talk series.

- 應科院與一家生產商公司簽訂了一項逾180萬港元的授權和服務協議，授權並設計多層透明表面的視覺檢測技術。製造研發組已完成了一個觸控面板玻璃缺陷的檢測系統，並在客戶於內地的廠房進行實地測試。

模組和集成

- 應科院已把心血管監測技術授權予多家香港及國內領先的健康產品製造商。此外，亦已把無創式血糖監測技術授權給多家香港及國內的健康產品製造商。

- 在2015年8月，其中一家心血管監測技術的授權商與我們簽訂約80萬港元的授權延續協議。

- 應科院已完成把心血管監測技術轉移給一家香港的醫療產品製造商，產品預計在2017年第一季上市。

信息安全與數據科學

應科院一直與香港金融管理局、金融機構和金融科技公司（包括多間初創企業）緊密合作，開發先進金融科技。應科院新成立了網絡安全研究所，並一直與香港金融管理局、香港警務處及主要銀行，如：香港匯豐銀行和中銀香港等，共同進行不同的網絡安全研究、培訓和情報分享系統。應科院網絡安全研究所亦與不同金融服務機構以及金融科技初創企業共同進行網絡保安漏洞研究，並研發雲端保安系統和大數據分析產品及系統。

應科院一直與業界和大學共同努力，培育金融科技的人才。我們與本地大學，如香港大學建立科研與教學合作平台，讓教授、學生及應科院的研究人員，在金融科技項目上共同合作。此外，我們亦制定培育年輕企業家的方案及舉辦一系列的金融科技講座。

Having developed a computational engine based trading system for t.Axiom Solutions Limited, we are currently working alongside Genius Union Limited and Nebula Technology to develop applications that are based on the big data platform. We have also developed an open quant cloud platform, in cooperation with the Chinese University of Hong Kong and the University of Hong Kong. The platform analyses stock data and the latest news, advises trading strategies, and conducts rick assessment for investors. Besides, we have successfully developed remote cryptographic biometrics authentication for cloud applications and biometrics ticketing.

我們曾為權理院科技有限公司開發以計算引擎支援的交易系統，目前正與滙雋有限公司及上海雲熠信息科技有限公司進行合作，為他們提供大數據處理平台的相關應用。另外，我們與香港大學和中文大學合作，用開放式大數據平台結合雲端計算引擎，研發出量化投資交易平台。此平台能分析實時股票數據及最新資訊，從而提供交易策略選擇方案，並為投資者進行風險評估。此外，我們已經成功研發出滿足客戶需求的遠程指紋、面部授權應用，以及基於指紋和面部識別的電子票據應用。

ASTRI Security Lab
應科院網絡安全研究所

Software and Systems

ASTRI has successfully commercialised the digital pathology high-speed slide scanning technology, with products already available in the market. In addition, our automated tuberculosis smear screening system has been licensed for computer-aided diagnosis systems, and the relevant products are currently at the industrialisation stage.

軟件與系統

應科院已成功將數字化病理學高速幻燈片掃描技術商業化，並且在市場上已有相關產品。此外，我們亦已把所研發的自動化肺結核塗片篩查系統授權予產品開發商，應用在電腦輔助診斷，而相關產品目前正處於成品化階段。

Technology Application in Public Sector

Communications Technologies

LTE Network Trials and Deployment

ASTRI's small and micro cell solution provides the commercial network equipment for local operators and the authorities to establish trial network for forward-looking technologies. It also provides exclusive network for mission-specific wireless connectivity for the public sector.

Opto-electronics

Interactive Display Technologies for the Elderly

ASTRI has completed the installation of Portable Interactive Projector and Interactive Touch Panel for six NGO sites to improve the elderly population's quality of life. The technology setup was applied to enhance brain-training activities. Taking into consideration movement constraints of the elderly, we have designed the device in such a way that the elderly can handle it with ease. Incorporating the hardware with suitable games, the device enables the elderly to enjoy their social lives while enhancing their mental agility. In March 2016, ASTRI supported Hong Kong Housing Society's AFC (Age Friendly City) Lounge Carnival and provided demonstration to other NGOs and government organisations.

ASTRI's Interactive Touch Panel installed in the elderly service centre
應科院互動式觸控框架應用於長者服務中心

應用於公營機構的科技

通訊技術

LTE網絡試驗和部署

應科院的小基站和微基站方案為本地營運商和公營機構提供商用網絡設備，幫助客戶建立具前瞻性技術的試驗網。此外，我們也向公營機構提供專用網絡，以試驗一些與無線連接相關的特殊項目。

光電子

長者互動技術

應科院在香港六個非政府組織的長者服務中心完成安裝兩項的裝置：「便攜式互動投影機」和「互動式觸控框架」，以提高長者的生活質素。這兩項技術成功提高長者大腦訓練活動，即使長者活動能力有限，也能用手指或手寫筆在觸控屏上一起玩遊戲。這類技術結合硬件與適合的遊戲，讓長者可以享受社交生活，思維更敏捷。在2016年3月，應科院成功支持香港房屋協會（房協）的「全球長者友善城市嘉年華會」，並提供示範給其他非政府組織和政府機構。

ASTRI's Portable Interactive Projector applied in the elderly service centre
應科院便攜式互動投影機應用於長者服務中心

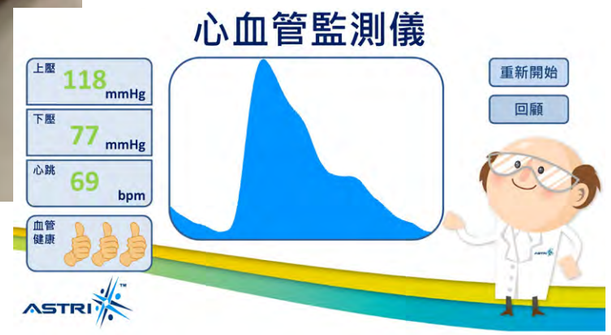
Cardiovascular Monitoring Device

We have been working closely with the Jockey Club Centre for Positive Ageing (JCCPA) and Cadenza Hub on the design and the user trial of a cardiovascular monitoring device for use in elderly homes and primary healthcare centres. Design of the device has been completed and training of the elderly centres' caregivers was conducted on the use of the device.

心血管監測儀

應科院得到賽馬會耆智園及流金匯的協助，在其轄下的長者中心和健康中心，就心血管監測儀的設計和實用性進行用戶測試。應科院已完成監測儀的改良設計及培訓中心員工使用改良的心血管監測儀。

ASTRI's Cardiovascular Monitoring Device
應科院心血管監測儀



Security and Data Sciences

Cyber Range Laboratory

In 2016, Hong Kong's first Cyber Range Laboratory was established by ASTRI in collaboration with Hong Kong Police Force. The facility is built to raise the technical readiness of law enforcement and other major institutions against fast-increasing malicious cyber-attacks on critical systems in the territory. Located at ASTRI's office in the Hong Kong Science Park, it is designed to provide state-of-the-art, hands-on training to cybersecurity practitioners in law enforcement agencies and financial institutions, and to conduct investigations and counter newly-found cyber-attacks. The Cyber Range Lab is equipped with advanced cyber-attack and defence training management systems, as well as virtual systems that can simulate tens of thousands of cyber-attacks as well as malicious software samples.

信息安全與數據科學

網絡安全研究與培訓中心

應科院在2016年與香港警務處合作成立香港首間「網絡安全研究與培訓中心」，旨在為執法部門及其他主要機構提升專業技術水平，以應對針對重要系統的惡意網絡攻擊。近年，本港惡意網絡攻擊的個案迅速增長，該中心設於香港科學園的應科院，配備先進設施，除了為執法部門和金融機構的網絡安全人員提供最先進的培訓，亦用作調查最新的網絡攻擊和研發防禦方案。該中心配備嶄新的網絡攻擊及防衛培訓管理系統和多個模擬系統，這些模擬系統能產生逾萬多次的網絡攻擊及十萬多個惡意軟件。

ASTRI Cyber Range Laboratory
應科院網絡安全研究與培訓中心

The Cyber Range Laboratory aims to provide state-of-the-art trainings to cybersecurity practitioners in law enforcement agencies and financial institutions
應科院網絡安全研究與培訓中心旨在為執法部門和金融機構的網絡安全人員提供最先進的培訓

ASTRI Security Lab Intelligence

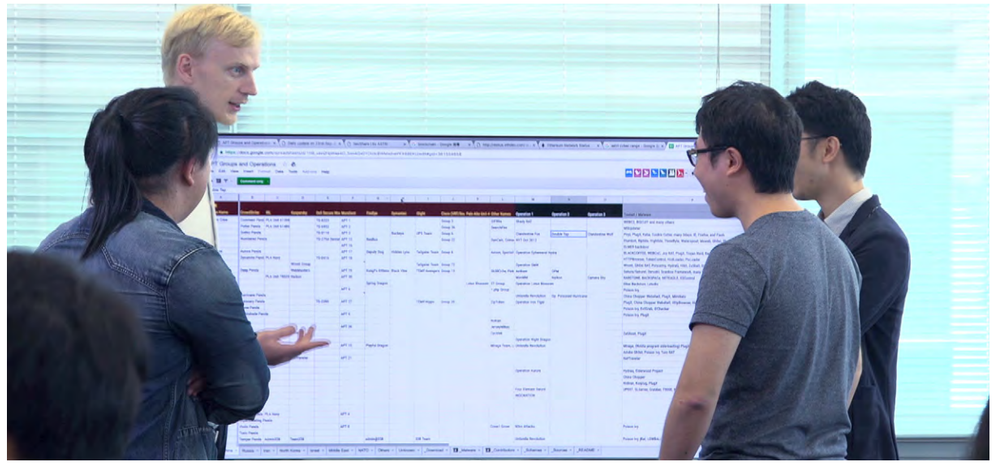
ASTRI Security Lab (ASL) has developed a system which is able to collect, consolidate and analyse cybersecurity intelligence, such as attack methods, attack sources and destinations, hacker group campaigns, cyber defense techniques and mechanisms, in order to better defend against cyber-attacks.

The cyber intelligence system provides a spontaneous, secure and centralised intelligence network for the financial sector, law enforcement and intelligence organisations to share cybersecurity intelligence with a view to strengthening their defense and agility against cyber-attacks.

網絡安全情報站

應科院網絡安全研究所研發了網絡安全情報站。該系統可收集、綜合和分析網絡安全情報，包括黑客攻擊手法、入侵的來源和目標、黑客組織活動、網絡防禦技巧和機制等，希望藉此更有效地對抗網絡攻擊和尋找出解決方案。

應科院開發的網絡安全情報系統，能提供即時、安全和統一的安全網絡及威脅情報，有助金融業、執法及情報監管等機構互相交流網絡安全情報，加強在金融服務應對網絡攻擊的防禦能力和靈敏度。



ASTRI Security Lab Intelligence
網絡安全情報站

Software and Systems

軟件與系統

The 'Magi Guide' application
「迷導」應用程式

Internet of Things (IoT) via BLE Application and System

ASTRI's IoT BLE technology was used on a number of occasions for educational purpose and exhibition showcase.

Training sessions were conducted for Vocational Training Council (VTC) students on how to use the IoT BLE technology (mobile software development kit and cloud server) to embark on three summer projects which were to be evolved into final-year projects. We provided constant mentoring to the students until project completion. This exercise has not only promoted ASTRI technology to a wider audience but also sown the seed for nurturing future innovators.

A mobile application with cloud server, demonstrating indoor navigation using BLE devices, was showcased to the public during InnoCarnival 2015 at Hong Kong Science Park. The App allowed visitors to locate themselves within indoor premises, and navigate to their desired exhibition locations.

Trial: Telehealth Technology Platform

A hybrid BLE/GPS tracking system, which could monitor and track the elderly movements during outdoor activities, was deployed for trial by the Tung Wah Group of Hospitals (TWGHs). TWGHs plans to use the system to improve service quality in their day-to-day operations, for instance, it could alert caregivers if any of the Alzheimer's disease patients wanders away accidentally during an outdoor activity.

物聯網：低功耗藍牙應用和系統

應科院應用了物聯網低功耗藍牙技術於不同場合以作教學和展覽用途。

應科院的科技部為職業訓練局學生提供了培訓課程，使用應科院移動軟件開發工具和雲服務器的技術，開展了三項暑期課程，而這些課程也計算為學生畢業成績的項目。科技部為學生提供恆定的指導，直到項目完成。這項工作不僅讓應科院得以向更廣泛的受眾傳承技術，同時也播下種子，培育未來研發的人才。

應科院在香港科學園舉辦的創新科技嘉年華2015中，向公眾展示了使用低功耗藍牙設備作室內導航的雲端移動應用程式。這程式能為遊客在室內定位，並能提供智能導航到一處指定的地方。

測試：遠距健康照護技術平台

應科院向東華三院提供一個揉合了低功耗藍牙技術和全球定位（GPS）技術的追踪系統，可監測和追踪院內的長者在戶外活動時的行踪。東華三院已作臨床測試，並計劃使用這系統以改善他們日常運作的服務質素，在戶外活動時，如有腦退化症患者離開活動範圍，系統會提醒看護人員。

Reports of Technology Divisions

Communications Technologies

Overview

The Communications Technologies Division (CT) was established in 2005 to conduct research, and to develop and commercialise leading-edge communications technologies and solutions for industries and the community, through value-added information and communications technology (ICT) applications and services.

CT researchers and engineers come from diverse geographic, academic and professional backgrounds. Most of them have worked in overseas multinational corporations and research institutes.

Consolidating our core technical competence in the following areas, we provide end-to-end system solutions covering:

- Networking Software (NSOFT): large-scale and real-time software in telecom networks, network management, network virtualisation and Internet of Things/Vehicles (IoT/IoV) management
- Baseband Solutions (BSOL): one of the worldwide pioneers in LTE and beyond standard compliant communications technologies, including baseband and upper layer protocol stacks
- Emerging Systems (ESYS): 5G technologies, software-defined radio, high-efficiency RF, dynamic spectrum utilisation, and Broadband Wireless Innovation Platform

科技部報告

通訊技術

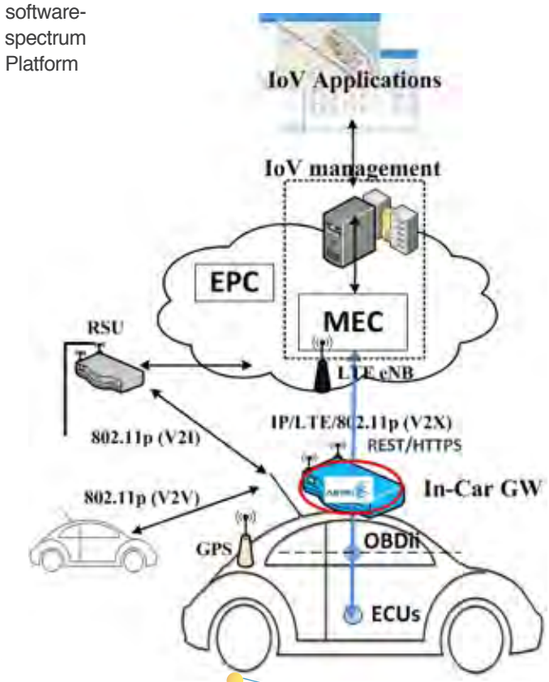
概況

通訊技術科技部成立於2005年，致力進行研究，開發尖端的通訊技術和解決方案，並把有關方案商用化，為業界和社會提供增值資訊及通訊科技應用和服務。

通訊技術研發人員來自不同的國家，學術和專業背景，大多數更具有在跨國公司或研究機構的工作經驗，為團隊和合作夥伴帶來廣泛而寶貴的專業知識和經驗。

通訊技術科技部的核心技術能力涵蓋以下方面，可提供端到端系統解決方案，包括：

- 網絡軟件（NSOFT）：大規模和實時的電訊網絡軟件、網絡管理、網絡虛擬化和物聯網（IoT）/車聯網（IoV）管理；
- 基帶解決方案（BSOL）：標準兼容的長期演進系統（LTE）及後續技術，包括基帶和高層協議棧；及
- 新興系統（ESYS）：第五代移動通訊（5G）技術、軟件定義無線電、高效率的射頻、動態頻譜技術、以及寬帶無線創新平台。



Internet-of-Vehicles Management
車聯網管理

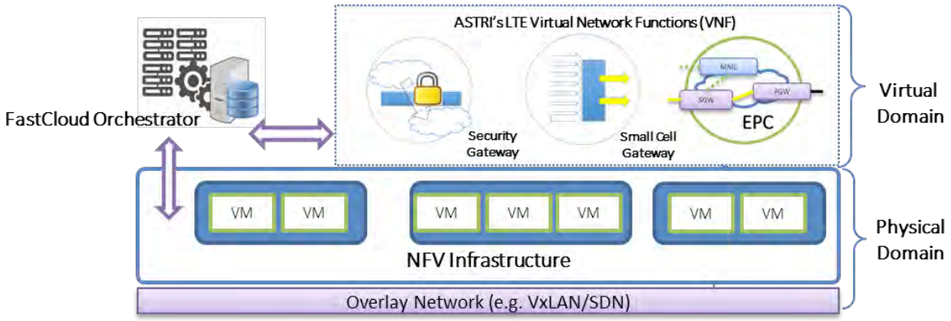
CT works closely with the Government, industries, universities, and research institutes worldwide to deliver market-driven, commercially viable solutions.

Technology Focus and Services

Networking Software (NSOFT)

The Networking Software Group currently offers virtualised LTE and next generation mobile core network software and IoT/IoV management platform.

The Group provides telecom-grade virtualised mobile core network software with Network Function Virtualisation (NFV) and SDN capabilities (known as virtual network functions), including Evolved Packet Core (EPC), small cell gateway, and IPSec security gateway. All of them provide excellent performance and high availability capabilities under x86 virtualised platforms. With virtualisation, ASTRI's virtualised mobile core virtual network functions can be flexibly deployed on general purpose x86 hardware. The virtualised core network can be easily and simultaneously reconfigured with different network topologies, functions (e.g. adding security gateway for better security) and resources (such as CPU/network) to address specific purposes (e.g. low latency, high bandwidth, access control rights) in a tailored manner.



ASTRI virtualised mobile core technologies with NFV and SDN
應科院具備網絡功能虛擬化（NFV）和軟件定義網絡（SDN）的虛擬移動核心網技術

These technologies are licensed to customers for deployment in public and private LTE networks (e.g. internal signalling network to support subway line operations). The Group collaborates with major players (such as Intel) on NFV technologies.

通訊技術科技部與政府、業界、大學和研究機構緊密合作，開發以市場導向，具有商業價值的技術方案。

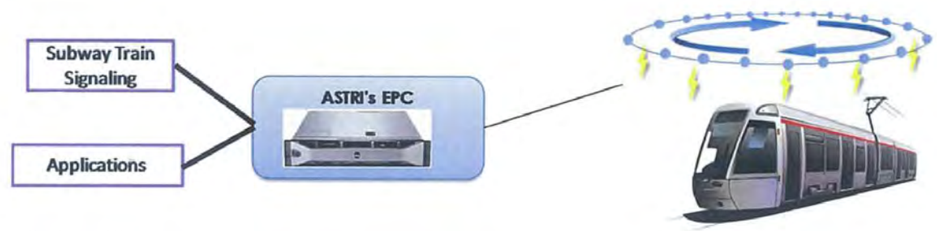
技術重點與服務

網絡軟件

網絡軟件研發組提供虛擬化的LTE、新一代移動核心網及物聯網（IoT）/車聯網（IoV）管理平台。

網絡軟件研發組提供具備網絡功能虛擬化（NFV）和軟件定義網絡（SDN）功能的電訊級虛擬移動核心網絡軟件，包括核心網絡（EPC）、小基站網關和安全網關。這些軟件在x86虛擬平台下均有優異的性能和容量。應科院虛擬化移動核心網絡功能，可以靈活而有效運用在通用的x86硬件。虛擬化的核心網可以靈活地配置網絡拓撲、功能（如為提供更佳的安全性能而增加安全網關）和資源（如CPU/網絡），以滿足特定的場景和應用要求（如低延遲、高帶寬、存取控制權限）。

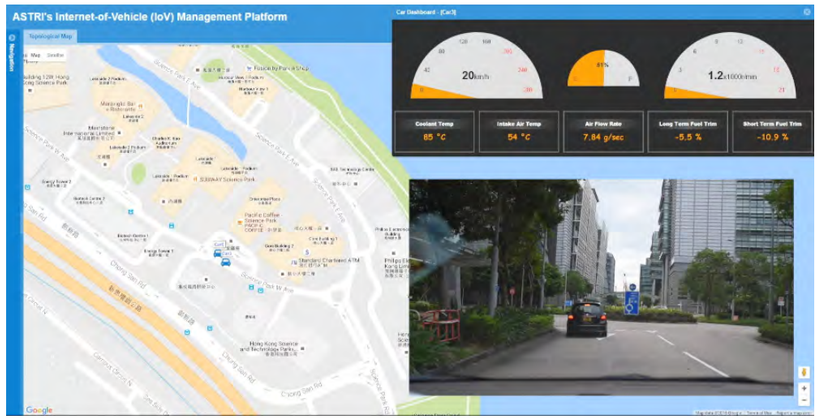
這些技術已授權給客戶在公共和私人LTE網絡上使用（如地鐵線的內部操作訊號網絡）。網絡軟件研發組亦與業界主要的公司（如英特爾）在NFV技術上合作。



ASTRI's EPC deployments to support subway train signalling system
應科院核心網絡（EPC）支援地鐵路訊號系統

IoT/IoV management platform can support various devices, scales and scenarios, such as smart home, solar street light management, and solar power station. The IoV management platform enables monitoring of vehicle status, including speed, acceleration and reading of various sensors, via OBDII interface.

物聯網/車聯網管理及應用平台支援不同設備、規模和場景，如智能家居、太陽能路燈管理和太陽能電站等。同時，車聯網平台的車內診斷接口（OB-Dii）可監控車輛的狀態，包括速度、轉數度和各種車傳感器數據等。



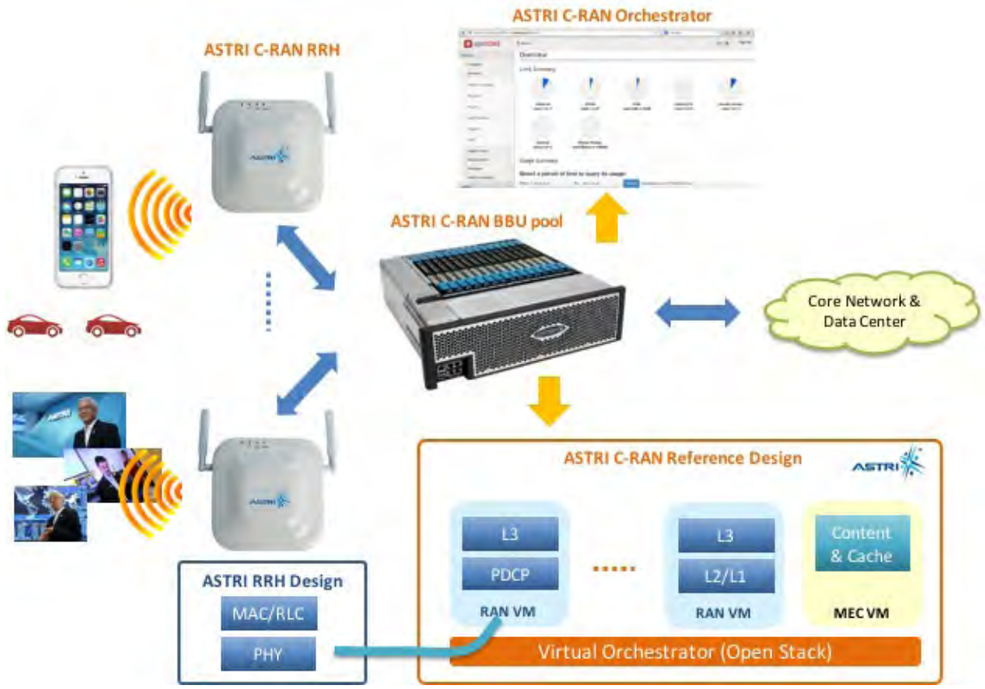
ASTRI's Internet-of-Vehicles management platform
應科院車聯網管理及應用平台

Baseband Solutions (BSOL)

In collaboration with industry partners, the Baseband Solutions Group delivered the world's first commercial grade FDD/TDD dual-mode LTE small cell and TD-LTE terminal baseband core reference designs. These technologies address the demand for high speed mobile data and higher quality services in both public telecom and private mobile networks.

基帶解決方案

通過與業界夥伴合作，基帶解決方案研發組曾經推出了全球第一款商用級頻分雙工和時分雙工（FDD/TDD）雙模制式LTE小基站和TD-LTE終端基帶參考設計。這些技術滿足了公共和專用移動網絡對高速數據和高品質服務的需求。



ASTRI's C-RAN
應科院集中化無線接入網絡

The Group's reference designs are industry-proven and have passed inter-operability tests by infrastructure vendors and operators. In particular, with the professional support of the Group, its partners have been able to pass a leading operator's stringent tender tests on small cells and terminals. The design ranked first in China Mobile's small cell tendering.

The Group is developing next generation Centralised Radio Access Network (C-RAN) technologies to enhance overall cellular network throughput by coordinated interference-management and radio resource allocations. The C-RAN architecture also allows general IT equipment to serve communication-specific processing which further reduces the cost and power consumption of the cellular networks. Other ongoing R&D efforts include next generation small cell technologies, physical layer algorithms for ultra high-speed mobile communications in 5G, and low cost LTE machine-type communications (MTC) terminal reference design for the IoT.

我們的參考設計通過了業界的驗證及多間通訊設備供應商和營運商的互通性測試。我們更協助合作夥伴通過了主要營運商的嚴格小基站與終端集採測試。該設計在中國移動小基站採購中排名第一。

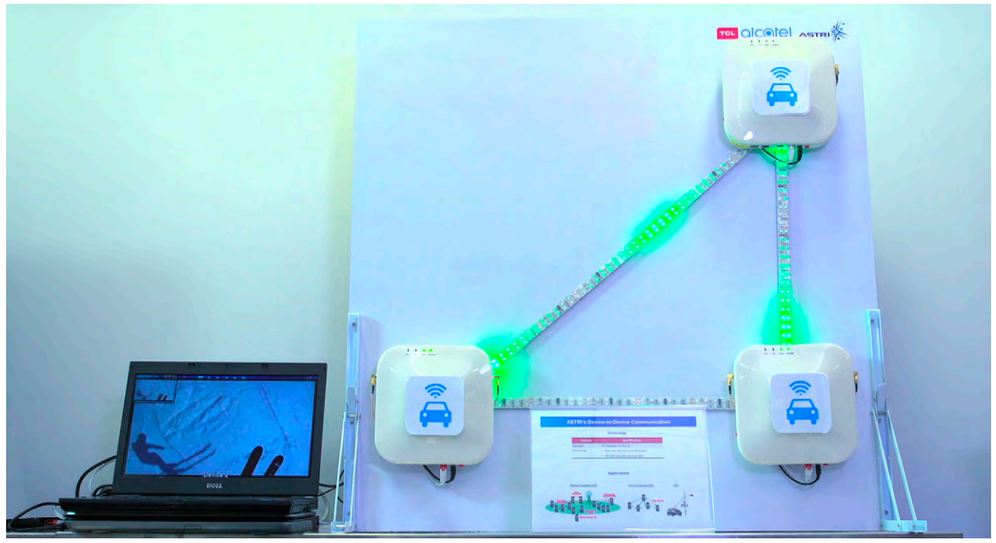
我們正研發新一代集中化無線接入網絡（C-RAN）技術，通過干擾協調管理和無線資源分配提升全面的網絡吞吐能力。C-RAN架構也允許通用的資訊科技設備進行特有的無線訊號處理，從而進一步降低蜂窩網絡的成本和功率消耗。其他研發中的技術還包括新一代小基站技術、5G超高速移動通訊物理層算法和用於物聯網的低成本LTE機器類型通訊（MTC）終端參考設計。

Emerging Systems (ESYS)

The Emerging System Group is undertaking projects to develop a Software Defined Radio (SDR) platform and core technologies for 5G cellular systems to increase spectrum efficiency, and reduce both hardware cost and energy consumption. The Group is also developing LTE Device-to-Device (D2D) technologies for public safety networking and smart city applications. In addition, the Group is involved in developing the Vehicle-to-Everything (V2X) technologies for smart car applications.

新興系統

新興系統研發組進行不同的項目研發，包括5G蜂窩系統的軟件定義無線電平台和核心技術，提升頻譜效率，減低硬件成本和降低能源的消耗。我們亦開發適用於公共安全網絡和智慧城市應用的LTE端到端通訊技術。我們也參與用於智能汽車應用的汽車通訊（V2X）技術的研發。



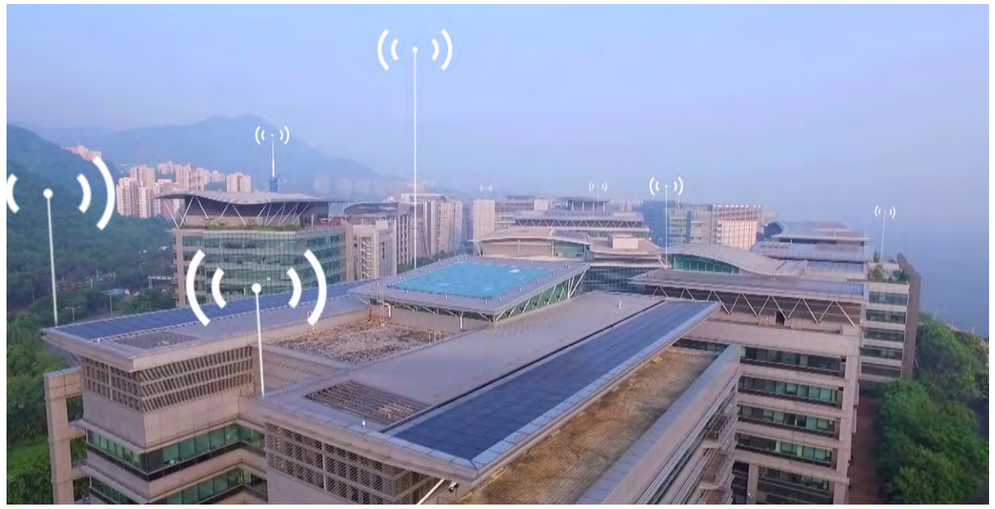
5G Technology
5G技術

Working with government bodies and cellular operators, the Group conducts trials on state-of-the-art wireless technologies to enable new application solutions (e.g. dynamic spectrum sharing technologies for TV white space and unlicensed band). It is also developing an open Wireless Innovations Platform (WIP) by integrating ASTRI's and other third party technologies to provide a configurable network environment for system development, integration and verification.

The Group also collaborates with leading industry partners and the academia to create IPs and contribute to 4G/5G standardisation initiatives.

我們與政府機構和電訊商合作，通過試驗網絡，驗證先進的無線技術（例如，電視白頻段和未授權頻段的動態共享技術），提供新的應用解決方案。同時，我們建立了一個開放的無線創新平台（WIP），採用應科院及第三方的技術，為系統的開發、集成和驗證提供可配置的網絡環境。

我們也積極與業界龍頭夥伴和學術機構合作，開發專利技術，並參與4G/5G標準的制定。



Wireless Innovation Platform (WIP)
無線創新平台

Applications and Innovation

Major research outputs of CT have been applied in the following areas:

- The licensable, commercial-grade, and standard based virtualised LTE has been licensed to multiple customers (Intel, Zyxel, Sunnada) and public operators to build virtualised LTE networks. With virtualised LTE core networks, operators can build multiple networks for different purposes, e.g. prepaid SIM services, enterprise customers, and IoT services.

- The Internet-of-Vehicle (IoV) management platform can be used to keep track of the location (GPS), fuel consumptions and sensor readings, which improves and modernises fleet management.

- LTE/LTE-A small cell and micro cell baseband reference design has been licensed to multiple customers (e.g. Sunnada, HBFEC, Sunwave and Innofidei) which have adopted it in their base station products and multiservice distributed antenna system (MDAS) products to improve system capacity and coverage in public mobile networks. Some of the products target private enterprise wireless broadband communications, e.g. communication services for railways, oil fields and coal mines.

技術應用及創新

通訊科技部的主要科研成果已經被應用於以下範疇:

- 通訊技術科技部的可授權、商用級及符合標準的虛擬LTE已經授權給多家客戶如：（英特爾、合勤科技、三元達）和公共營運商以建立虛擬LTE網絡。透過虛擬LTE核心網絡，營運商可以因應不同的用途建立多種虛擬LTE網絡，如預付智能卡費用服務、企業客戶和物聯網服務。

- 車聯網管理平台可以通過讀取車輛的全球定位系統位置（GPS）、汽油消耗和傳感器數據，加強車隊的管理能力。

- LTE/LTE-A小基站和微蜂窩的基帶參考設計已授權給多家客戶（例如：三元達、河北遠東通訊、三維通信和創毅視訊），並獲採用和應用到他們的小基站產品和多業務分佈式天線系統的產品上，以改善系統容量及公共移動網絡的覆蓋率。其中一些產品以企業專網的無線寬頻通訊為目標，例如：鐵路、油田和煤礦的通訊服務。

Sunnada small cell with DAS
三元達具備分布式天線系統的小基站

- C-RAN solution provides a flexible and power-efficient software based centralised baseband pool for commercial LTE/LTE-A deployment. This is also very suitable for private networks which have application-specific requirements.

- LTE MTC user terminal (UE) reference design provides the communication link for IoT, which can be used in many vertical markets for value generation, such as smart grid for medical, retail, and fleet management.

- 5G SDR platform provides a flexible platform for realising advanced next generation wireless technologies, such as joint transmission/reception, new waveform and massive MIMO for 4.5/5G technologies development and verification.

- The Open Broadband Wireless Innovation Platform (WIP), which is an end-to-end LTE network demo system, has been set up to provide a configurable network environment for system development, integration and verification.

- 集中化無線接入網絡（C-RAN）方案為商用LTE/LTE-A部署提供了靈活和高效能的軟件化集中式基帶池。該方案也非常適合有特殊應用需求的專用網絡。

- LTE機器型通訊使用者終端參考設計提供有效的物聯網通訊連接，適用於多類縱向市場的應用，例如：智能電網、醫療、零售和車隊管理。

- 5G軟件定義無線電平台提供靈活的開發平台，實現新一代先進無線技術，例如用於4.5G/5G技術發展和驗證的技術包括聯合傳輸/接收、新波形、大規模的多入多出天線。

- 通訊技術科技部已成立了一個開放式寬頻無線網絡（WIP）。WIP是一個端到端的LTE網絡系統平台，為系統開發、整合及驗證提供一個可配置的網絡環境。

During the year in review, CT has delivered a number of innovations as follows:

- It is working closely with industry leaders on Network Function Virtualisation technologies. Intel has invited ASTRI to join the Intel® Network Builders programme to promote NFV technologies. ASTRI's virtualised Evolved Packet Core and Small Cell Gateway was showcased in the Network Infrastructure Solutions Library of Intel.

在本年度中，通訊技術科技部已成功實現了以下多項創新：

- 我們與網絡功能虛擬化技術的業界龍頭企業緊密合作。英特爾已經邀請應科院加入英特爾®網絡建設計劃，促進網絡功能虛擬化的技術發展。應科院在英特爾的網絡基礎設施解決方案庫內展出虛擬化的演進分組核心和小基站網關。

Intel® Network Builders Programme
英特爾®網絡建設計劃

- It is performing research on its own FastCloud Orchestrator, which is an innovative and powerful tool to visually plan, deploy and reconfigure end-to-end virtual LTE network. Traditionally, LTE end-to-end network deployments and reconfigurations involve a lot of manual operations, which are time-consuming and error-prone. FastCloud Orchestrator allows users to design and understand the network topology and functions (such as MME, SGW) in a drag-and-drop manner. The whole virtual network provisioning and reconfiguration can be completed reliably within a few minutes.

- 我們正自行研發FastCloud編排器，可以規劃、部署和重新配置端到端的虛擬LTE網絡，是個創新和強效工具。傳統上，LTE端到端的網絡部署/重新配置涉及大量人手操作，十分耗時且容易出錯。FastCloud編排器可以允許其用戶利用滑鼠拖曳的操作方式，設計和了解網絡拓撲和功能（如MME，SGW）。整個虛擬網絡的建立和重新配置可以在幾分鐘內完成。

- It is working on commercial grade LTE/LTE-A small cell and micro cell reference design, including baseband and protocol stack algorithms. The following are some of the examples:
  - Industry-proven LTE/LTE-Advanced baseband technologies
  - Industry's best commercially available multi-mode Sniffer solution, which enables Self-Organising Network (SON), VoLTE and radio interface-based synchronisation
  - SON algorithms such as mobility load balancing (MLB) and inter cell interference coordination (ICIC)
  - VoLTE: supports simultaneous calls up to 32/64 UEs with good mean opinion score (MOS) and short call setup time. Support VoLTE enabling protocol stack features, including robust header compression (RoHC), discontinuous reception (DRX), semi-persistent scheduling (SPS) and transmission time interval (TTI) bundling

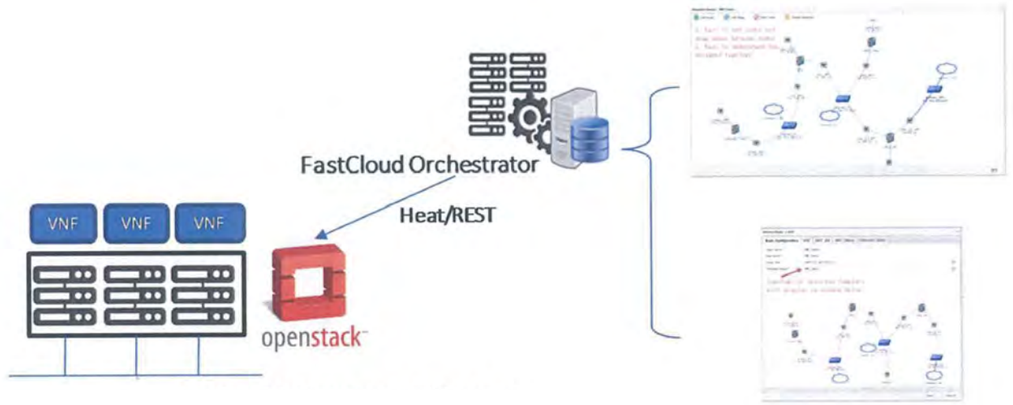
- LTE MTC UE reference design:
  - Release 12 Cat 0
  - Release 13 Cat M UE in the roadmap
  - Low cost and power efficient
  - Extended coverage

- LTE D2D UE reference design:
  - Release 12 sidelink transceiver design
  - Roadmap for V2X applications
  - Low cost and power efficient
  - Extended coverage

- 商用級LTE/LTE-A小基站和微基站參考設計，包括基帶和協議棧算法。例子如下：
  - 業界認可的LTE/LTE-Advanced基帶技術
  - 業界最佳的商用多模網絡偵聽解決方案，支援自組網絡技術、VoLTE 和無線接口同步技術
  - 自組網絡算法，例如移動負載均衡技術（MLB）和基站間干擾協調（ICIC）。
  - VoLTE：支援高達32/64組用戶終端的同時通話，並有良好的平均意見得分（MOS）和較短的通訊建立時間。支援VoLTE實現協議棧，包括穩健的包頭壓縮（RoHC）、不連續訊號的接收（DRX）、半永久性調度（SPS）和傳輸時間間隔捆綁（TTI Bundling）。

- LTE機器型通訊終端參考設計：
  - 版本 12 Cat. 0
  - 版本 13 Cat. M UE規劃的版本
  - 低成本和低功耗
  - 擴展的覆蓋範圍

- 支持LTE終端直連的通訊終端參考設計：
  - 版本 12 側向鏈路收發設計
  - 規劃支持V2X應用
  - 低成本和低功耗
  - 擴展的覆蓋範圍



FastCloud Orchestrator Architecture
FastCloud 編排器架構

Project Highlights 重點研發項目

Project 項目	Duration 時期
5G Radio Access Technologies 5G 無線接入技術	Jul 2014 – Apr 2015 2014年7月至2015年4月
4G & Beyond Network Virtualization Architecture (4GNV) 4G及下一代的網絡虛擬化架構	Oct 2014 – Jul 2015 2014年10月至2015年7月
Radio Access Technologies for Next Generation Networks 新一代通信網無線接入技術	Jun 2015 – Feb 2016 2015年6月至2016年2月
In-Car Gateway Software for Internet-of-Vehicles (IoV) 用於車聯網的車內網關軟件	Jan 2016 – Sep 2016 2016年1月至2016年9月
Emerging System for Efficient and Dynamic Spectrum Utilization 高效及動態頻譜共享的新興系統	Mar 2016 – Dec 2016 2016年3月至2016年12月
Active Antenna System Development Platform 有源天線系統開發平台	Oct 2013 – Apr 2015 2013年10月至2015年4月
Internet of Things Management and Application Platform with Broadband Wireless (IMAP) 物聯網設備管理和應用平台	Feb 2014 – May 2015 2014年2月至2015年5月
Self-organizing and Coordinated LTE Small Cells 自優化和協調 LTE 小型基站	Apr 2014 – Oct 2015 2014年4月至2015年10月
WiFi + 4G Convergence Gateway Software Platform WiFi + 4G 融合網關平台	Dec 2013 – Nov 2015 2013年12月至2015年11月
Open Broadband Wireless Innovation Platform (WIP) 開放型無線寬頻創新平台	Aug 2014 – Jul 2016 2014年8月至2016年7月
LTE Machine Type Communications (MTC) Baseband Technologies LTE機器類型通訊基帶技術	Mar 2015 – Sep 2016 2015年3月至2016年9月
High Efficiency RF System 高效射頻系統	Mar 2015 – Jan 2017 2015年3月至2017年1月
Virtualization for 4G and Beyond Mobile Networks (NFV) 4G 及下一代的移動網絡功能虛擬化	Sep 2015 – Sep 2017 2015年9月至2017年9月
Next Generation Small Cells 新一代小基站	Mar 2016 – Sep 2017 2016年3月至2017年9月

Electronics Components

Overview

The Electronics Components Technology Division (EC) specialises in market-driven solutions focusing on advanced packaging technologies, materials development and module integration for application in consumer electronics, Internet-of-Things (IoT), automotive electronics, and power electronics. This year, EC expands the scope of its research to material development and module integration for application in smart home, wearable electronics, electronic cars, etc., which are expected to bring substantial economic returns and social benefits to both local and overseas markets. EC has been delivering all the objectives earmarked against nine ITF projects, among which three were successfully completed, three are ongoing, and three have newly commenced.

EC transferred its technologies and products to 10 Hong Kong and Mainland companies through existing collaborative projects and new contracts with a total value of more than HK$14 million (~32.6% industrial contribution). Besides, EC has signed six contracts with some tier-one electronic component manufacturers and some small to medium technology enterprises. A collaborative agreement was signed with Infineon Technologies Hong Kong Ltd. for the development on thermal management solutions to enhance product performance. These contracts enable the partner companies to rapidly realise commercial products with EC's enabling technologies.

On intellectual property development, EC has released six new inventions regarding power electronics and electrodeposition technologies. In addition, eight patents were filed in China and the US and 13 patents were granted, further strengthening its value proposition to the customers.

The two key Core Competence Groups of EC, namely Packaging (PACK) and Lithium-ion Battery (LIB), will continue to expand relevant research and development activities within the scope of each technology trend to maintain EC's leading position on the core competencies.

電子元件

概況

電子元件科技部擅長設計市場導向的技術方案，主力研發可應用於消費電子產品、物聯網、汽車電子和電力電子的先進封裝技術、物料開發和模組集成。本年度電子元件科技部把研究範圍擴大至可用於智能家居、穿戴電子產品、電動汽車等多個領域的物料開發和模組集成，為本地及海外市場帶來更大的經濟回報與社會效益。電子元件科技部去年開展了九個創新及科技基金項目，其中三個項目已成功完成、三個項目正進行中及三個項目剛開始。

電子元件科技部透過現有的合作項目和新的合約，成功轉移其技術和產品到十家香港和內地的公司，總值超過14,000,000港元（32.6%業界收入）。此外，電子元件科技部與數家一線電子元件製造商和多間中小型科技企業簽訂了六份合約，其中電子元件科技部跟英飛凌科技香港有限公司就開發提高產品性能的熱能管理解決方案簽定了合作協議。這些合約讓各個合作夥伴可以利用電子元件科技部的應用技術，迅速製成商業產品。

在知識產權發展方面，電子元件科技部就有關電力電子及電沉積技術申請了六項新研發。此外，科技部提交了八項美國或中國專利，並獲授十三項專利申請，進一步向客戶強化其價值主張。

兩個主要研發小組：封裝小組和鋰電池小組，將繼續在各自的範疇內就科技發展的趨勢，擴展相關研發活動，以保持其核心技術的領導地位。

Technology Focus and Services

EC seeks to establish its core competence and infrastructure in the following four major aspects:

- Multi-physics designs including electrical design, substrate design, thermo-mechanical design and chippackage- substrate co-designs
- Manufacturing process recipes including High Density Interconnect (HDI), Si interposer, 3D Integrated Passive Devices (3D-IPD), 3D-SiP and Through-Silicon-Via (TSV)
- Materials formulation and synthesis including polymer additives, Sn-based anode and lithium rich cathode materials
- Comprehensive R&D laboratory and pilot line including wet laboratory, 3D-SiP, reliability and failure analysis

Synthesis of polymer additives for lithium-ion batteries
鋰離子電池聚合物添加劑的合成

技術重點與服務

電子元件科技部於以下四個主要方面建立了其核心研發能力及相關基礎設施：

- 多重物理設計，包括電路設計、基板設計、熱機械設計和芯片封裝基板共同設計；
- 生產工藝配方，包括高密度互連（HDI）、矽載板、3D集成無源器件（3D-IPD）、3D系統級封裝（3D-SiP），以及硅通孔（TSV）；
- 材料配方與合成，包括聚合物添加劑、錫基負極和富鋰的正極材料；及
- 功能齊備的研發實驗室和試驗線，包括濕實驗室、3D系統級封裝、可靠性和失效分析。

Spray drying treatment of lithium rich cathode materials
富鋰正極材料的噴霧乾燥處理

Applications and Innovation

With the establishment of the core competencies and infrastructure, EC focuses on high-frequency and highpower related applications, including consumer electronics, automotive electronics, and power electronics. During the reporting period, EC expanded its research field to applications in smart home, wearable electronics, and electronic cars etc.

技術應用及創新

電子元件科技部擁有核心技術能力和基礎設施，使之能專注於研發高頻及高功率相關應用，包括消費電子技術、汽車電子技術、及電力電子技術等。在本年度內，電子元件科技部把研究範圍擴大至應用於智能家居、穿戴電子及電動汽車等多個領域。

Miniaturised Dual-frequency RFID Reader (MDR) w/ NFC Functions for Smartphone

Radio-frequency identification (RFID) technology has proved to be very effective in anti-counterfeiting and logistics management. It is widely regarded as one of the most important sensing technologies for Internet of Things (IoT). ASTRI has successfully developed the miniaturised dual-frequency RFID reader SiP (System-in-Package) with near-field communication (NFC) functions for smartphone. The final package size is ~15x15x1.2 mm^3. It can achieve a reading range of 10 mm for NFC and 35-100 cm for ultra-high frequency (UHF) RFID with external tuning circuit and antenna.

The compact SiP can be integrated into smartphones to achieve both NFC and UHF RFID Reader functions. Customers may carry the RFID smartphone with NFC function and use value-added services like food authentication and retail store inventory management. Besides, this smartphone design will gradually facilitate smart transportation, smart logistics, asset management, anti-counterfeiting and mobile payment etc.

應用於智能手機兼具有近場通訊（NFC）功能的小型化雙頻RFID讀寫器

射頻識別（RFID）技術在防偽認證和物流管理方面的成效已備受肯定，也被公認是物聯網的關鍵傳感技術之一。應科院成功開發了一個應用於智能手機、帶有近場通訊（NFC）功能的雙頻射頻識別讀寫器的小型化系統級封裝（SiP）。最終封裝尺寸為15x15x1.2立方毫米。經由外部調諧電路和電線，它可以實現NFC10毫米的讀取範圍及高頻RFID35-100厘米的讀取範圍。

結合NFC及超高頻功能的小型化SiP可應用於智能手機，客戶可以隨身攜帶此具有NFC功能的RFID手機使用各項增值服務，如食品認證和零售店舖庫存管理。此外，此類手機已經逐步應用在智慧交通、智慧物流、設備監控、防偽認證以及手機支付等領域。

RFID smartphone with NFC and EPC UHF functions can achieve a reading distance of 35-100cm
結合NFC及EPC UHF功能的RFID智能手機的讀取距離達到35-100厘米

Lithium Rich Cathode Material (LRCM) for High Energy Density Advanced Lithium-ion Battery (LIB)

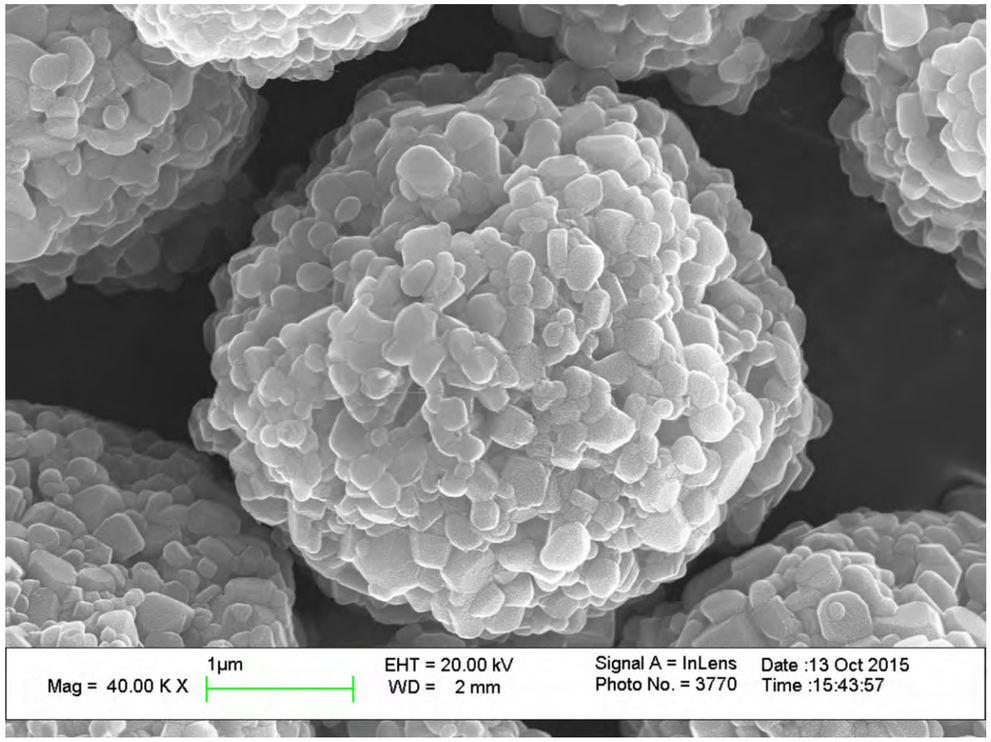
Due to the growing popularity of mini-sized portable electronic devices, high energy density batteries as the portable power storage source for consumers and healthcare devices are in great demand. Using its competent technology in active material synthesis, ASTRI has developed a new cathode material for high energy density LIB. With minimal use on expensive elements, the cathode material is cost-competitive. Li-Mn-Ni-O based new cathode material can demonstrate a specific capacity of 180 mAh/g, a full cell comprising the ASTRI lithium rich cathode and high capacity anode was fabricated and evaluated to demonstrate energy density of 620 mWh/cm^3.

The developed lithium-ion battery may serve as an improved portable energy supply for electronic devices such as RFID reader, portable healthcare electronics, and wearable display etc.

先進高能量密度鋰離子電池富鋰正極材料

隨著小型便攜式電子設備不斷增長，消費者和醫護界對高能量密度電池這類便攜式電力儲存能源的需求也日益增加。應科院利用電池合成活性材料技術以開發了一款新型富鋰正極材料，用於高能量密度的鋰離子電池。由於正極材料採用極少的貴價元素，其價格在市場上具有競爭力。此Li-Mn-Ni-類型的新型富鋰正極材料，容量大於180 mAh/g，富鋰正極和高容量負極將組裝成全電池，其能量密度達到620 mWh/cm^3。

此高能量密度的鋰離子電池，可以作為用於電子裝置的便攜式能源供應，例如RFID讀寫器、便攜式醫療電子產品和穿戴式顯示器等。



Scanning electron microscope (SEM) image of lithium rich cathode materials
富鋰正極材料的掃描電子顯微鏡圖

CETC – ISA and ASTRI co-establish an Innovation Joint Lab in 2016
創新院及應科院於2016年共同成立創新聯合實驗室

Collaborations

CETC-ISA and ASTRI Innovation Joint Lab

Academy of Information Science Innovation of China Electronics Technology Group (CETC-ISA) and ASTRI established an Innovation Joint Lab in 2016, to promote technology exchange and collaborations on integrated circuits, electronic components, software and system, information security and information science, communication and big data etc. The Joint Lab also carries out technology exchange for power electronic module development. CETC-ISA focuses on the development of micro systems, Internet of Things, information security, network communications and related cutting-edge technologies.

夥伴合作

創新院及應科院創新聯合實驗室

中國電子科技集團公司信息科學研究院（創新院）及應科院於2016年共同成立了創新聯合實驗室，為促進雙方在積體電路、電子元件、軟體與系統、資訊安全與資訊科學、通訊技術及大數據等領域的技術交流和合作，聯合實驗室特別為電力電子模組相關技術開展技術交流。創新院重點研發微系統、物聯網、資訊安全、網絡通訊等尖端技術。

Project Highlights 重點研發項目

Project Name 研發項目	Duration 時期
3D High Power Electronics Modules 三維大功率電力電子模塊	Mar 2014 – Sep 2015 2014年3月至2015年9月
New Electrodeposition Additives for Next-Generation 3D-Interconnect 應用於下一代三維互連技術的新型電沉積添加劑	Mar 2014 – Dec 2015 2014年3月至2015年12月
Miniaturized Dual-frequency RFID Reader (MDR) w/ NFC Functions for Smartphone 具有NFC功能的用於智能手機的微型化雙頻RFID讀寫器	Aug 2014 – May 2016 2014年8月至2016年5月
New Materials & Process for Next-generation High Density Interconnect Applications (NMP-HDI) 應用於下一代高密度互連的新材料和工藝	Mar 2015 – Nov 2015 2015年3月至2015年11月
Integrated Power Module for Networking and Telecommunication Equipment (IPM-NTE) 應用於網絡和通訊設備的集成功率模塊	Mar 2015 – Mar 2017 2015年3月至2017年3月
Lithium Rich Cathode Material for High Energy Density Advanced LIB (LRCM-F) 先進高能量密度鋰離子電池富鋰正極材料	Dec 2014 – Dec 2016 2014年12月至2016年12月
Medium-range Wireless Power Transfer (MWPT) Technology for Smart Home 應用于智能家居的中距離無線電能傳輸技術	Mar 2016 – Nov 2016 2016年3月至2016年11月
Grafted Polymer Insulator for Through-Silicon-Via (GPI-TSV) Applications 以接枝聚合物作為矽通孔絕緣材料的技術開發	Mar 2016 – Dec 2016 2016年3月至2016年12月
New Materials & Process for Next-generation High Density Interconnects (NMP-HDI) 應用於下一代高密度互連的新材料和工藝	Mar 2016 – Sep 2017 2016年3月至2017年9月

ASTRI Annual Report 2015 - 2016 應科院年報

IC Design (Analog)

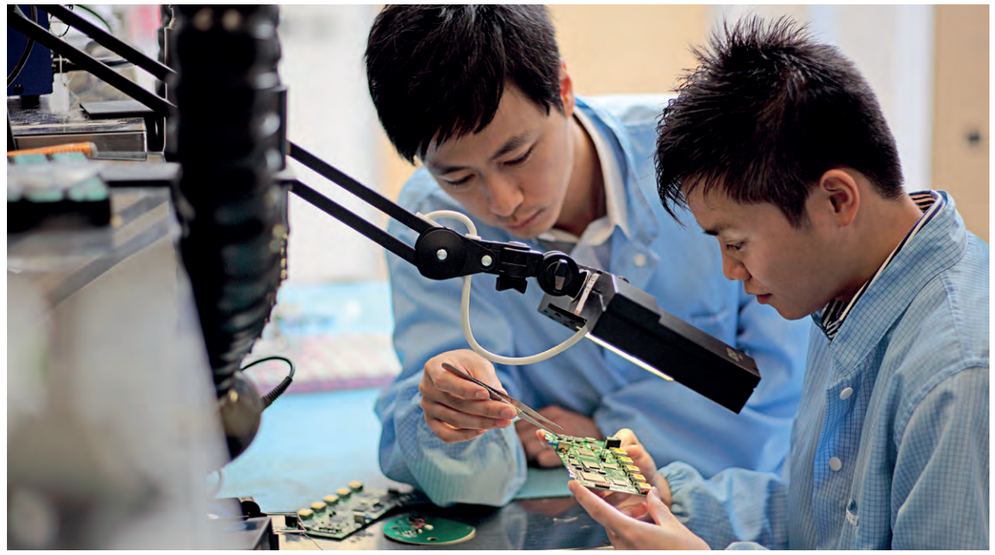
Overview

The IC Design (Analog) Technology Division (ICDA) has over 50 talented designers dedicated to develop and realise leading-edge ICs and solutions. It is a part of the first Chinese National Engineering Research Centre outside of the Mainland. The targeted IC applications cover Internet of Things (IoT), wireless communications, and sensor signal processing, etc.

集成電路設計（類比）

概況

集成電路設計（類比）科技部有超過五十名專業的設計人員，致力研發領先的集成電路和技術方案。該科技部屬本港首家國家工程技術研究中心的其中一部份。該科技部的集成電路應用涵蓋物聯網、無線通訊及傳感器訊號處理等。



ICDA is dedicated to develop and relaise leading-edge ICs and solutions
集成電路設計（類比）科技部致力研發領先的集成電路和技術方案

ICDA offers competitive Intellectual Properties (IPs) and IC solutions in the following key technology areas:

- Wireless IoT System on Chip (SoC) Design
- Ultra Low Power IC Design
- Electrostatic Discharge (ESD) and Input/Output (I/O) Design Technology

科技部在以下的重點技術研究範疇提供具競爭力的知識產權（IP）及集成電路技術方案：

- 無線物聯網系統晶片（SoC）設計
- 超低功耗集成電路設計
- 靜電防護（ESD）和輸入/輸出（I/O）端口設計技術

Technology Focus and Services

ICDA strives to realise leading-edge ICs and solutions. Several technology initiatives are underway and the Division will continue to pursue its goal of developing innovative technologies for the industry.

技術重點與服務

科技部致力研發先進的集成電路和技術方案，現正進行數個科技項目，並會繼續為業界發展創新科技。

RFIC Design

The RFIC Design Group provides wireless connectivity solutions for full range coverage with state-of-the-art low power integrated circuit design, which includes Narrow Band Internet of Things (NB-IoT) for wide area connectivity, Bluetooth Low Energy (BLE) for local and personal area connectivity, Near Field Communication (NFC) for convenient and secured interfacing.

Low Power Design

The Low Power Design Group has developed a range of silicon proven IPs for sensor signal processing. These IPs can be widely adopted in various applications such as wireless electrocardiography, uncooled infrared micro-bolometer, pulse oximetry and G-sensor. Many of these have already been licensed to customers for mass production.

Design Technology

The Design Technology Group focuses on the development of advanced semiconductor devices and modelling. It provides solutions for ESD protection devices, semiconductor sensors and other novel semiconductor devices. Its core competence includes virtual fab platform and compact model extraction methodology. Using these technologies, semiconductor process development and device design/optimisation can be realised virtually and efficiently. It has developed comprehensive IP portfolios for device design and modelling, including area-efficient ESD structure IPs, process independent scalable IO libraries and BSIM models.

ICDA is closely collaborating with IC foundries and design houses to develop unique advanced semiconductor devices and model IPs in CMOS technologies. It has successfully delivered device/model IPs from 0.5um to 40nm process.

Applications and Innovation

- NB-IoT is the upcoming public cellular network standard for IoT applications. It is easy to use and can penetrate deeply into almost all locations. Besides, it is able to support IoT devices to operate for years on a small battery. It will be a platform through which the IoT market could enjoy substantial growth. While being able to enhance many existing applications such as metering, remote sensing and telemetry, NB-IoT will accelerate the rapid development of the mass IoT market by providing reliable, low-cost and accessible connectivity for even the most low-cost and low-power devices such as municipal lighting, waste management, livestock breeding, irrigation, and environment monitoring. A set of NB-IoT IPs is being developed by ICDA.

- Bluetooth Low Energy (BLE) consumes only a fraction of the power of the classic Bluetooth radio. ICDA has developed key RF transceiver IP blocks including Low Noise Amplifier (LNA), mixer, switched capacitor filter, digital Phase Locked Loop (PLL) and Power Amplifier (PA). The BLE RF transceiver, BLE digital baseband and BLE SoC peripherals were integrated into a single chip BLE SoC in both 0.18um and 65/55nm technologies. As a result, it can extend the use of BLE to devices that are powered by small batteries such as watches, toys, sports, fitness and healthcare devices, keyboards and mice, beacons and wearable electronics.

- The healthcare market has been evolving in recent years due to an ageing population. On the other hand, advancement in mobile technology has generated a great demand for mobile health monitoring devices. Meeting the needs arising from the trend, ICDA has developed the analog and mixed signals (AMS) IP to be deployed in mobile health monitoring devices for signal acquisition of vital signs including heart rate, pulse oximetry, breathing rate and stress analysis.

射頻晶片設計

射頻晶片設計團隊為業界提供全方位無線連接的技術方案，而這些技術方案均採用低功耗集成電路設計，包括窄帶物聯網（Narrow Band Internet of Things, NB-IoT）覆蓋廣泛區域的連接、藍牙低功耗（Bluetooth Low Energy, BLE）提供短距離的連接、近場通訊（Near Field Communication，NFC）則提供簡便和安全的接口。

低功耗設計

低功耗設計團隊開發了一系列已流片驗證的IP模塊，用於傳感器訊號處理。這些IP能廣泛應用，如無線心電圖機、非制冷紅外線微測輻射熱計、心率血氧儀和重力加速度計等。很多IP已經授權予客戶實現量產。

設計技術

設計技術團隊專注於先進半導體器件的開發與建模。該小組可為靜電防護器件、半導體傳感器和其他新型半導體器件提供技術方案。核心技術包括虛擬製造平台和集約模型提取方法學。採用這些技術，可以在虛擬平台上以高效率進行半導體工藝開發和器件設計與優化。該團隊已經開發了多種器件與模型IP，包括緊湊型靜電器件結構IP、與工藝無關可縮放的IO庫以及BSIM模型庫等。

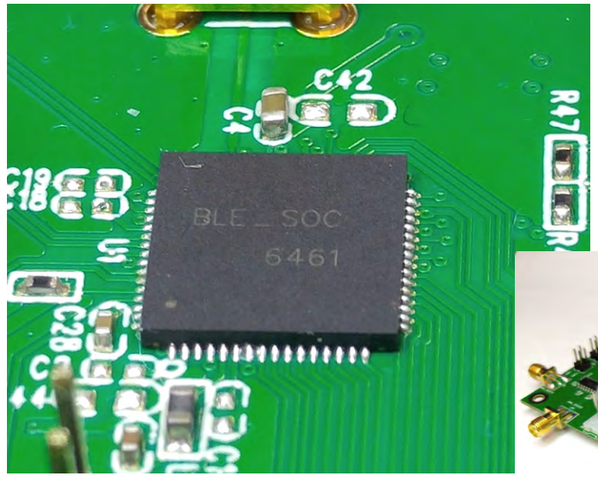
該小組與集成電路生產廠商和電路設計公司緊密合作，開發CMOS工藝中的新型半導體器件與模型IP，所成功開發的器件與模型IP均可覆蓋0.5微米到40納米的工藝節點。

技術應用及創新

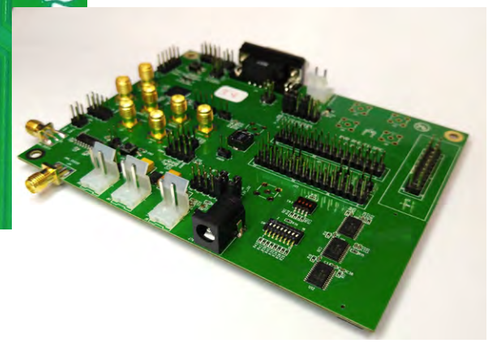
- 窄帶物聯網是建基於公共移動網絡上，為物聯網應用而設定的新國際標準。簡單易用，覆蓋率高，只須一顆小電池，就能支援物聯網設備經年運作。這平台將會有助物聯網市場實現大幅增長。它不但可以增強現有的應用，如測量、遙感、遙測等，還可透過提供可靠、低成本和高覆蓋的網絡，推動大規模物聯網市場的快速發展，涵蓋照明管理、廢物管理、畜牧養殖、灌溉、環境監測等低成本低功耗的應用。集成電路設計（類比）現正開發一系列窄帶物聯網集成電路IP。

- 相比傳統藍牙無線技術，藍牙低功耗（BLE）的耗電非常低。集成電路設計（類比）科技部開發了BLE上射頻收發器的關鍵IP，包括低雜訊放大器（LNA）、混頻器、開關式電容（SC）濾波器、數字鎖相環（PLL）和功率放大器。該BLE射頻收發器、BLE數字基帶和BLE系統晶片外設已被集成在兩個0.18微米和65納米技術的BLE系統集成電路。它使藍牙無線技術的應用擴展到小型紐扣電池供電的設備，例如手錶、玩具、運動、健身和醫療保健設備、鍵盤和滑鼠、beacons和穿戴電子。

- 由於人口老化情況，近年本港的醫療保健市場不斷擴大。而隨著移動技術不斷發展，市場對移動健康監察設備的需求亦日益增長。為迎合市場趨勢，集成電路設計（類比）科技部研發了類比和混合訊號（AMS）IP，可以應用於移動健康監控設備，進行監測生命徵象，如心率、脈搏、血氧飽和度、呼吸頻率和壓力分析等應用。



Bluetooth Low Energy (BLE) IC
低功耗藍牙（BLE）芯片


Bluetooth Low Energy (BLE) test board
低功耗藍牙（BLE）測試板

NB-IoT will be the global standard based on public and spectrum-licensed 4G/LTE networks. A set of NB-IoT IPs including RF transceiver, baseband and protocol are being developed by ICDA and will be delivered by 2017. NB-IoT is a wide-area wireless technology which enables ubiquitous connections. It dramatically expands the scope of people-based computing into the area of autonomous smart devices. Anything can be connected to the NB-IoT network from anywhere, regardless of its distance to the base station. It will be the conduit for IoT products and application manufacturers to enter the lucrative market that is based on the NB-IoT standard and eco-system.

Collaborations

Hong Kong Branch of the Chinese National Engineering Research Centre (CNERC) for Application Specific Integrated Circuit System

In the past year, the Hong Kong Branch of CNERC put its focus on microelectronics and integrated circuits (IC) and systems, and conducted research, technology transfer and talent training in the fields of analog IC design, digital IC design and packaging. The Hong Kong Branch cooperated actively with the main centre and RF centre of CNERC in Southeast University on technology exchanges and commercialisation. Three joint projects were launched, and three others were completed last year. The Hong Kong Branch and the main centre of CNERC in Southeast University are now actively planning a series of new projects with a view to carrying out deeper and longer-term cooperation in the future.

窄帶物聯網（NB-IoT）是以授權頻譜的4G/LTE網絡為基礎的全球新標準。集成電路設計（類比）科技部正在開發應用於NB-IoT的集成電路IP，包括射頻收發器、基帶和作業模式，並計劃於2017年完成。NB-IoT是一個廣域的無線技術，令人們可以隨時隨地連接上網。NB-IoT主要是針對消費者的需要，透過自動化的智能裝置進行資料運算處理。有了此技術，物聯網設備便可隨時隨地連接到NB-IoT的網絡，而不會因基站的位置而受到限制。物聯網產品和應用的廠商就可以基於NB-IoT標準和生態系統，進入這個利潤豐厚的市場。

夥伴合作

國家專用集成電路系統工程技術研究中心香港分中心（CNERC）

在過去一年，國家專用集成電路系統工程技術研究中心香港分中心（CNERC）圍繞微電子以及集成電路和系統，在類比集成電路設計、數字集成電路設計及封裝三個方向進行研究、技術轉移以及人才培養等工作，並取得良好成績。CNERC正積極與位於東南大學的主中心和射頻中心開展技術交流和市場化活動。過去一年，共開展了三個合作項目並完成三項合作項目。香港分中心和位於東南大學的主中心現着手計劃一系列新的合作項目，以期待將來展開更深更廣的長期合作。

ASTRI™ 上海华虹集成电路有限责任公司 Shanghai Huahong Integrated Circuit Co.,Ltd.

ASTRI and Shanghai Huahong Integrated Circuit Joint Laboratory of Wireless IoT Technologies & Applications

ASTRI and Shanghai Huahong Integrated Circuit Co. Ltd. (SHHIC) announced the opening of a joint laboratory on wireless Internet of Things (IoT) technologies and applications, fostering collaboration between ASTRI and SHHIC and developing single-chip system level solutions for smart cities and intelligent transportation applications.

The establishment of 'Joint Laboratory of Wireless IoT Technologies & Applications' aims to strengthen the long-term collaboration between two parties. SHHIC has strong expertise in smart card and information security chips design. ASTRI has strong expertise in wireless, radio frequency (RF) and analog design. The joint laboratory is a perfect match of expertise from both parties to develop wireless IoT chips at terminals and sensor nodes side. These IoT chips are single-chip system level solutions which include all functionalities of RF transceiver, baseband, security, protocol and CPU for applications of smart cities and intelligent transportation locally and nationally.

應科院 - 華虹設計無線物聯網技術及應用聯合研發中心

應科院與上海華虹集成電路有限責任公司（華虹設計）宣布成立無線物聯網技術及應用聯合研發中心，促進雙方合作，並為智慧城市和智能交通的應用軟件，共同研發單芯片系統級整體方案。

華虹設計具有智能卡和信息安全芯片設計方面的專業知識，而應科院在無線、射頻和類比設計方面則擁有專業團隊；因此聯合實驗室對雙方來說無疑是一個完美的組合，兩者在無線物聯網芯片終端和傳感器節點端的開發方面自然相得益彰。這些物聯網單芯片系統級解決方案包括了射頻收發器、基帶、安全、作業模式和處理器等功能，可應用於當地及全國性的智慧城市和智能交通系統。

Project Highlights 重點研發項目

Project Name 研發項目	Duration 時期
uV Signal Detection and Advanced Signal Processing SoC Platform for Brain-computer Interface (BCI) 應用於腦機界面的微伏信號檢測和先進訊號處理系統晶片平台	Jan 2014 – Nov 2015 2014年1月至2015年11月
LTE-Advanced RF Transceiver Chip LTE-Advanced射頻收發器芯片	Sept 2014 – Mar 2016 2014年9月至2016年3月
Advanced Device IP Platform 先進器件IP平臺	Mar 2015 – Mar 2017 2015年3月至2017年3月
Ultra Low Power RF IPs & SOC Platform for BLE WBAN 用於低功耗藍牙（BLE）無線體域網（WBAN）的超低功耗射頻IPs與系統芯片平台	May 2014 – Mar 2016 2014年5月至2016年3月
AMS IP Platform for mobile health monitoring devices 移動健康監測設備的模擬和混合信號知識產權平台	Aug 2014 – Aug 2015 2014年8月至2015年8月
Semi-Autonomous Wireless Sensing IC Platform for IoT 半自主無線傳感物聯網集成電路平台	May 2014 – May 2015 2014年5月至2015年5月
RF Transceiver Architecture for Machine Type Communications 用於機器類型通訊的射頻收發機架構	Jun 2015 – Feb 2016 2015年6月至2016年2月
System-on-Chip for Next Generation Bluetooth Low Energy 下一代低功耗藍牙系統芯片	Mar 2016 – Aug 2017 2016年3月至2017年8月
IP Platform for Cellular Internet of Things 用於蜂窩物聯網的IP平臺	Mar 2016 – Nov 2017 2016年3月至2017年11月
Investigation of FinFET ESD Design FinFET 靜電保护設計研究	Mar 2016 – Mar 2017 2016年3月至2017年3月

ASTRI Annual Report 2015 - 2016 應科院年報

IC Design (Digital)

Overview

The IC Design (Digital) Division (ICDD) boasts state-of-the-art SoC design services - from advanced algorithm research to IC specification and implementation to production IC testing. ICDD has been making important contributions to the Chinese National Engineering Research Centre (CNERC) for Application Specific Integrated Circuit System (Hong Kong Branch). It strives to create valuable silicon IPs through market-driven in-house research for emerging IC applications in IoT communication, 3D and video superresolution and hardware-oriented secure data storage platform. ICDD is committed to value-creation by actively engaging partners in relevant industries and by channelling advanced research results from local universities to commercialisation through IC realisation and customisation. To enhance the competitive edge of industry partners, ICDD offers commercially-competitive IPs and total turn-key IC solutions.

ICDD focuses on the following key technology initiatives:

- IoT Communication IC
- Hardware-oriented Secure Data Storage Platform
- 3D and Super-resolution Video
- SoC Design Services

Technology Focus and Services

Communications

The Communications Group continues to develop and enhance high-performance power line communication processors. The Group implements silicon IPs to improve communication robustness over power line network based on various industry standards. The Group also develops Blockchain system protocols and applications. It evaluates and optimises Blockchain protocols to improve security, performance and scalability of these systems.

Video

The Video Group focuses on developing of innovative techniques to improve people's visual experience in display applications. The Group develops software and hardware accelerated solutions for super-resolution based HD-4K conversion. The solutions are used in 4K video production and broadcasting systems. The Group also applies Deep Learning Neural Network (DNN) models in image processing systems and develops bit depth optimisation algorithm to reduce the hardware implementation cost. In addition, 3D conversion is one of the technology focuses of the Group. It has developed a hardware platform to perform real-time 3D conversion for various 3D displays

集成電路設計（數碼）

概況

集成電路設計（數碼）科技部擁有最先進的系統晶片設計服務，涵蓋創新的程式計算研究、晶片規格、測試到製作晶片等服務。該部門為國家專用集成電路系統工程技術研究中心香港分中心作出重要貢獻。其使命是透過市場導向的內部研究，如新興物聯網通訊集成電路應用、3D顯示和視頻超高解像，以及硬件導向的安全數據儲存平台，創造具價值的流片IP。集成電路設計（數碼）科技部積極聯繫合作夥伴，透過實現和定制集成電路，將本地大學的先進科研成果市場化，以創造更高價值。為提升業界夥伴的競爭力，科技部提供商業上具競爭力的IP，以及全面的集成電路解決方案。

集成電路設計（數碼）科技部的研究集中在以下主要技術：

- 物聯網通訊集成電路
- 硬件導向安全數據儲存平台
- 3D顯示和視頻超高解像
- 系統晶片（SoC）設計服務

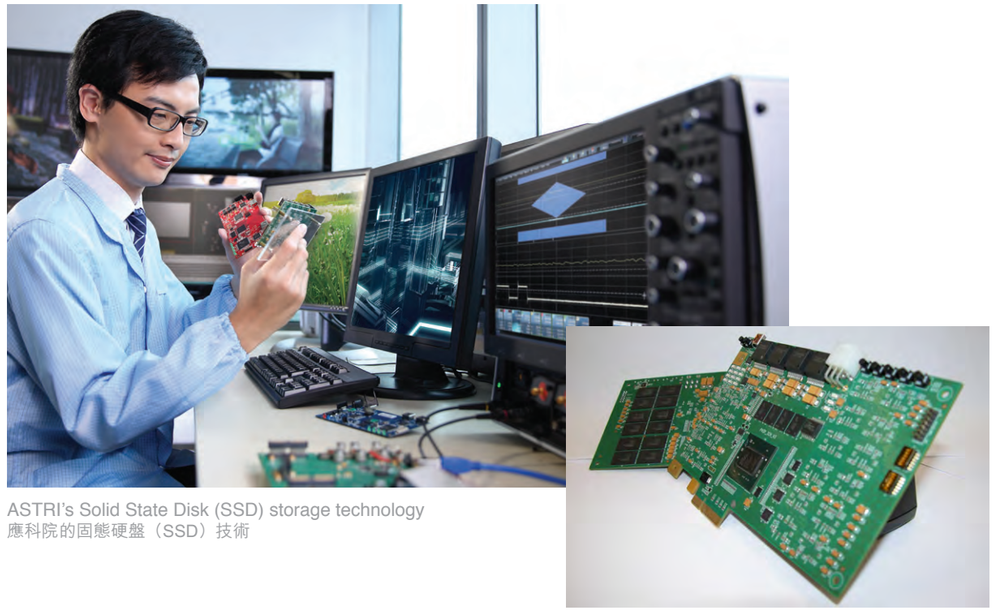
技術重點與服務

通訊

通訊研發組繼續開發及優化高性能電力線載波通訊處理器。該團隊實施流片IP，以提高多個業界電力線網絡通訊標準的穩定性。另外，該組亦開發區塊鏈系統的作業模式和應用，並評估和優化區塊鏈作業模式，以提升這類系統的安全性、性能和規模。

視頻

視頻研發組主力研發一些提升人們視覺體驗的技術平台。研發組開發了專為超高解像度之高清4000像素（4K）轉換器而設的軟件和硬件加速解決方案，用於4K視頻製作和廣播系統。研發組應用了深度學習神經網絡（DNN）模型於圖像處理系統，並且開發了比特深度優化算法，以降低硬件實現的成本。另外，3D轉換技術亦是視頻研發組內其中一個重點技術。研發組已開發一個硬件平台進行實時3D轉換，此平台可應用於各種3D顯示器之上，包括先進的超高清裸眼3D



ASTRI's Solid State Disk (SSD) storage technology
應科院的固態硬盤（SSD）技術

including state-of-the-art ultra-high definition spectacles-free 3D display. Moreover, the Group has developed the world's first software-hardware hybrid platform for 3D conversion. This platform can greatly expedite 3D content production by using the Field Programmable Gate Array (FPGA)-based hardware accelerator and custom-made software plug-ins.

SoC Design

The SoC Design Group realises IC's product ideas for innovative designs. Turning IC and system product ideas into real products involves various design processes covering architecture, digital logic, analog circuitry, physical, component simulation, system testing and software. The Group works closely with the other Groups under ICDD and the customers to implement their architecture designs and logic forms into a production-ready silicon and system platform. The support model is flexible enough to balance among the various trade-offs based on diversified design scenarios and maximal design value.

Hardware-oriented Secure Date Storage

Hardware-oriented Secure Data Storage Group focuses hardware secured solution on Solid State Disk (SSD) storage technology. ASTRI-developed SSD storage technology can be applied to USB 3.0, SATA and PCIe interface, offering users a convenient connection to host PC. The completed solution, including firmware and FPGA ones, is offered to the customers.

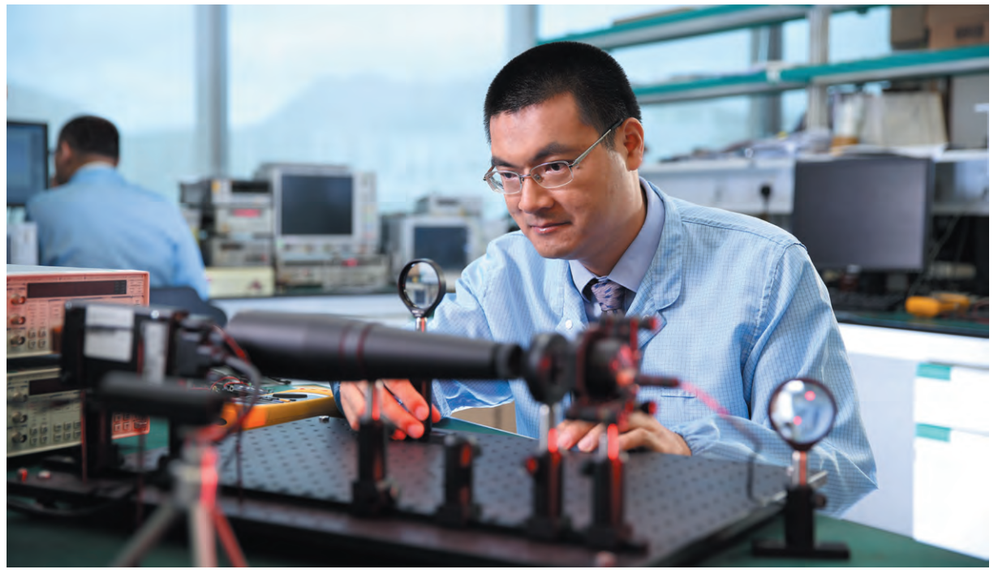
顯示器。此外，研發組亦已經開發世界首個軟硬件混合3D轉換平台。該平台通過FPGA硬件加速器和特製的軟件插件，大大減少3D內容的製作時間。

系統晶片（SoC）設計服務

系統晶片（SoC）設計服務研發組將創新的設計及集成電路的意念轉化為真實的產品。其中的流程包括：產品架構生成、數碼邏輯設計、類比電路設計、物理層面設計、電路仿真、系統測試以及軟件編寫等。科技部與其他部門以及客戶緊密合作，確保他們的設計能變成可隨時投產的晶片和系統平台。我們也為客戶提供靈活多樣的合作模式，平衡各種設計需求的代價，以達至最大的設計價值。

硬件導向安全數據儲存

硬件導向安全數據儲存研發組重點研發固態硬盤（SSD）技術的硬件安全解決方案。應科院開發的SSD技術可應用於USB3.0、SATA和PCIe介面上，為用戶提供便利的電腦對接。我們為客戶提供全面的解決方案，包括韌件和FPGA解決方案。



ASTRI's highly immersive and intelligent video technology
應科院的高沉浸感智能視頻技術

Applications and Innovation

- The Communications Group focuses on developing applications for secured IoT devices such as smart home, buildings and lighting. The Group collaborates with financial institutions in building custom Blockchain applications. It also works with regulatory bodies to help the financial industry to roll out Blockchain solutions.

- The 3D technologies developed by the Video Group can be widely applied in 3D conversion service, digital signage, movie and gaming. The applications can also be extended to education and medical imaging. The super-resolution based HD-4K conversion technology can be used in HD and 4K video content production, upgrading and broadcast.

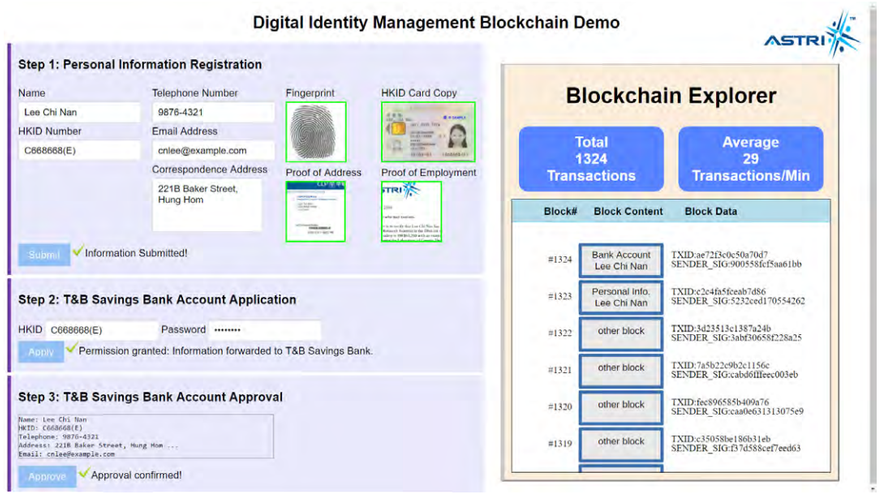
- The SoC Design Group has been developing Analog IPs for various IC applications. Both Analog IP blocks for SoC application and pure Analog base ICs are supported. Some of the examples are multichannel ADC for satellite navigation and video application, AFE for power line communication, network controller, motor driver, and ultra-low power timing control IC.The Data Storage Group has implemented several SSD storage products for customers to serve both the client and the server in cloud applications.

技術應用及創新

- 通訊研發組專注研發適用於物聯網設備之應用方案，包括智能家居、大廈和電燈。該組與金融機構建立區塊鏈應用方案，亦與監管機構合作，幫助金融業界推出區塊鏈解決方案。

- 視頻研發組開發的3D技術可廣泛應用於3D轉換服務、電子廣告板、電影及遊戲。該3D技術的應用亦可擴展至教育及醫學影像之上。而超高解像的高清4K轉換技術可以用於4K視頻內容製作、廣播，以及高清電影和視頻的升級。

- 系統晶片（SoC）設計服務研發組一直為各種集成電路應用發展類比IP，支援應用於SoC的類比IP模塊以及純類比基礎集成電路。研發組已開發衛星導航及視頻應用的多通道ADC、電力線通訊的AFE、網絡控制器、電機驅動器及超低功耗的時間控制集成電路。數據儲存研發組已製成數個SSD儲存產品，為客戶在雲端應用上提供客戶端和服務器端的服務。



Blockchain demo for Digital Identity Mangagement
數碼身份管理的區塊鏈演示

- ICDD has developed patents for power line communication synchronisation algorithms and IP implementation. This improves communication robustness in adverse power line environment.

- For Blockchain, ICDD has developed advanced authorised Blockchain protocols and hardware for financial applications.

- The algorithms being developed in 3D conversion aim to generate professional 3D output (for both stereo and auto-stereo) in real-time up to ultra-high definition, which are far more superior to any solution available in the market. The hardware accelerated software-

- 集成電路設計（數碼）科技部開發電力線載波通訊的同步算法和IP實現，以提高在惡劣環境下電力線的通訊穩定性。

- 至於區塊鏈，科技部開發先進並帶權限的通訊作業模式和硬件，以支援金融應用方案。

- 科技部所開發的3D轉換算法，可達至實時及超高清的高品質3D輸出（包括傳統3D左右圖和多視3D裸眼），該算法遠勝於市場上現有的方案。此外，科技部開發的硬件加速3D轉換平台，更是世界上

Real time 2K to 4K display
實時2K至4K轉換顯示

hardware hybrid conversion platform is also the world's first technology for 3D conversion. The DNN-based technology improves the visual quality of images, and the optimisation algorithm reduces the hardware implementation cost.

- A patent has been granted this year for analog circuit design in the area of low power and area saving. This innovation contributes to the success of several of our own and customers' ICs.

第一個軟硬件混合3D轉換技術。採用深度學習神經網絡（DNN）的技術提升了圖像的視覺質量，而優化的算法則降低了硬件實現的成本。

- 科技部研發之類比電路設計既省電又慳位，因此於今年獲授專利。這項技術突破協助我們和客戶在集成電路方面取得成功。

Establishment of ASTRI and SAPPRFT ABS Ultra High-definition Television Technology Joint Laboratory
成立「應科院 - 國家新聞出版廣電總局廣播科學研究院超高清電視技術聯合實驗室」

Collaborations

ASTRI and SAPPRFT ABS Ultra High-definition Television Technology Joint Laboratory

ASTRI and the State Administration of Press Publication, Radio, Film and Television (SAPPRFT) Academy of Broadcasting Science (ABS) signed a cooperation agreement for the establishment of the ASTRI – SAPPRFT ABS Ultra High-definition Television Technology Joint Laboratory. While strengthening cooperation on ultra high-definition and emerging video technology, the joint laboratory will also facilitate the development of comprehensive strategic partnership in different professional areas between the two institutions.

夥伴合作

應科院 - 國家新聞出版廣電總局廣播科學研究院超高清電視技術聯合實驗室

應科院與國家新聞出版廣電總局廣播科學研究院（廣電總局廣科院）成立了「應科院－國家新聞出版廣電總局廣播科學研究院超高清電視技術聯合實驗室」，並簽訂合作協議。聯合實驗室不但加強應科院和廣電總局廣科院在超高清及未來視頻技術領域的深度合作研究，亦促進雙方在更多專業領域發展

Besides, the collaboration will foster closer links between the Mainland and Hong Kong in technological innovation facilitating exchange between R&D centres, nurturing talents and promoting technological entrepreneurship. It is expected that the joint laboratory will create huge market value in the development and application of ultra high-definition and upcoming digital video technology for Hong Kong and the Mainland.

全面的策略性夥伴合作關係。此合作將推動中港科技創新聯繫，建立兩地研發機構科技交流、培育人才及促進科技創業。我們相信聯合實驗室的成立將為中港在超高清技術、未來數字視頻等技術的聯合開發及應用上創造龐大的市場價值。

Project Highlights

重點研發項目

Project Name 研發項目	Duration 時期
Visually Enhanced Ultra HD (VEUHD) 超高清顯示視頻提升技術	May 2014 – Feb 2016 2014年5月至2016年2月
Next-generation Interactive Display Platform (NIDP) 新一代互動顯示平台	May 2014 – May 2015 2014年5月至2015年5月
3D Conversion Technologies for Next Generation 3D Display 應用於下一代3D顯示的3D轉換技術	Oct 2015 – Apr 2017 2015年10月至2017年4月
Hardware Enabled Deep Convolutional Neural Network (DCNN) for Imaging Applications 硬件支持的深度卷積神經網圖像處理應用	Mar 2016 – Mar 2017 2016年3月至2017年3月
PCIe SSD Application Platform PCIe固態存儲應用平臺	Jul 2013 – Apr 2015 2013年7月至2015年4月
Next-Gen Nonvolatile Memory Controller Technology and Application 下一代非揮發存儲控制技術及應用	Jul 2014 – Apr 2015 2014年7月至2015年4月
PCIe Solid-State Disk Controller SoC PCIe 固態硬盤控制器芯片	Mar 2015 – Mar 2016 2015年3月至2016年3月
Smart Appliances Transceiver 智能家電收發器	Jul 2013 – Aug 2015 2013年7月至2015年8月
Advanced Powerline Communications 先進電力線通訊	Aug 2015 – Aug 2017 2015年8月至2017年8月
Hardware Acceleration in Financial Computing 金融運算的硬件加速技術	Jun 2014 – May 2015 2014年6月至2015年5月
Attack resistant cryptographic SoC for IoT devices 物聯網裝置防入侵加密系統芯片	Jun 2015 – Mar 2016 2015年6月至2016年3月
Secure Element for Mobile eTransaction 智能手機電子交易安全元件	Sep 2015 – Mar 2016 2015年9月至2016年3月
BeiDou/GPS Dual-mode baseband SoC 北斗/GPS雙模基帶SoC芯片	Nov 2015 – Mar 2017 2015年11月至2017年3月

Opto-electronics

Overview

Opto-electronics Technology Division (OE) has two Core Competence Groups that specialise in developing and commercialising market-driven solutions. The Manufacturing Technologies (MTECH) Group focuses on 3D machine vision, display and sensing, and intelligent industry robot. The Modules and Integration (MI) Group specialises in healthcare electronics for preventive healthcare.

MTECH contributes to ASTRI's Intelligent Manufacturing (IM) Initiative whereas MI contributes to ASTRI's Health Technologies (HT) Initiative. OE has been granted over 250 invention patents with over 160 technologies already transferred to industry. It has also embarked on new areas in exploring and developing deep learning-based defects classification technology and food safety and quality screening technology.

Technology Focus and Services

Manufacturing Technologies

The Manufacturing Technologies Group (MTECH) focuses on vision and perception technology development. Its core competence covers miniaturised optical engines, image understanding and metrology algorithms. The Group has two technology platforms:

The first one is the 'Machine Vision' technology platform which focuses on development of core technologies for visual defect inspection. The technologies include both 3D and 2D optical inspection systems, automation, and machine learning-based inspection algorithm development for next generation 'intelligent manufacturing' (industrial 4.0). The Group has been working with tier-one manufacturers to develop automated visual inspection systems for their production lines to replace operators on both functional and cosmetic defect inspections.

The second is the 'Intelligent Projection' technology platform, with its technology core competences on (1) LCoS panel design and packaging; (2) holographic projection optics and algorithm; and (3) optical sensing and metrology. The technology platform enables development of miniaturised projection together with sensing technologies for next generation display applications, including Head-up display (HUD), Head-mounted display (HMD) and Projection on surface (POS). The Group has developed a series of see-through display system covering Google Glass-like small FOV HMD, Large FOV see through HMD (>60 degree), combiner type palm size HUD (>10,000 nits@2W) and holographic projection display on glass; and integrated with proprietary sensing methodology for Natural User Interface (NUI) including hand, finger, face and eye detection and tracking features. These technologies and solutions would be applied to automotive, wearable and advanced manufacturing fields.

Applications and Innovation

3D/2D Machine Vision

- Defect inspection in Surface Mount Technology (SMT) process
- Consumer electronics manufacturing in-line inspection
- Automotive manufacturing
- Food and pharmaceutical in-line inspection
- Fabric and paper printing inspection

Intelligent Projection (HUD/HMD/POS)

- Education
- Entertainment
- Automotive
- Wearable display
- Manufacturing

光電子

概要

光電子科技部包含兩個研發組，致力研發以市場為導向的解決方案。製造研發組專注3D機器視覺、顯示與感應及智能工業機器人的技術研發；模組與集成研發組則專注於醫療保健電子技術的開發。

製造研發組配合應科院的「智能製造」研發方向，而模組與集成研發組則配合應科院的「健康科技」研發方向。光電子科技部已累積超過250項獲得授證的發明專利，並已把超過160項技術轉移至業界。研發組同時也朝向透過深度學習進行瑕疵分類的技術、食物安全與品質檢測等新範疇發展。

技術重點與服務

製造技術

製造技術研發組專注研發視覺與感知技術，核心技術涵蓋微型化光引擎和影像識別與認知算法。製造技術研發小組目前有兩個主要技術平台：

第一個是機器視覺技術平台，重點研發以自動化視覺技術進行瑕疵檢測，包括3D和2D光學檢測系統、自動化和機器學習檢測軟件算法的開發，以應用於新一代的智能製造（或工業4.0）。研發組已經與一線製造商合作，開發自動化視覺檢測系統，以代替操作員在生產線上檢測產品在功能和外觀方面的瑕疵。

第二個技術平台是以微型化投影加上感測的智能投影技術平台。其核心技術在於（1）LCOS芯片設計封裝技術，（2）全息投影及成像算法，（3）光學式感測及檢測算法。技術平台有助促進微型投影及感測的發展及新一代顯示系統方案的應用：包括車載抬頭顯示器（HUD），頭載式顯示器（HMD）以及投影於表面的應用（POS）。該研發組已成功開發出一系列透射式顯示系統包括谷歌眼鏡式的小視場頭戴顯示器、視場大於60度的頭戴顯示器、掌上型的高亮度抬頭顯示器以及投影在玻璃上的全息成像顯示，並結合專利的感測技術，包括針對手、手指、臉、眼進行檢測追蹤，這類界面方便人們以最自然的交流方式與機器互動。所開發的技術和方案將會應用到車載、可穿戴裝置以及先進製造等領域。

技術應用及創新

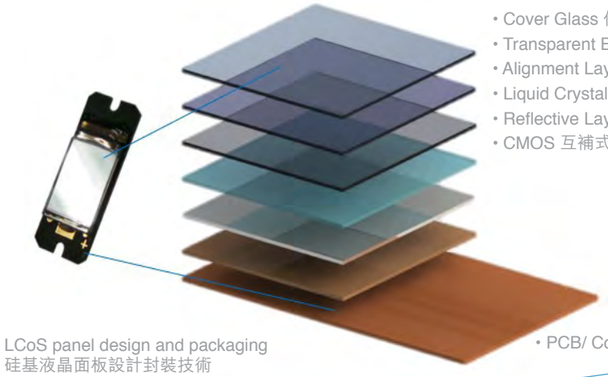
3D和2D機器視覺

- 表面貼裝工藝（SMT）的缺陷檢測
- 消費類電子生產的在線檢測
- 汽車生產
- 食品和藥品的在線檢測
- 紡織品和印刷品的檢測

智能投影 （HUD/HMD/POS）

- 教育
- 娛樂
- 車載
- 穿戴顯示
- 生產製造

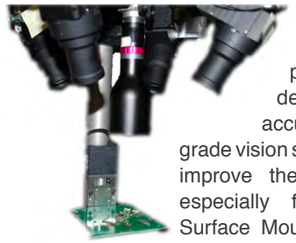
ASTRI's 3D machine vision technology
應科院3D機器視覺技術



LCoS panel design and packaging
硅基液晶面板設計封裝技術

Innovative 3D Machine Vision

OE's 3D machine vision (3D Solder Paste Inspection, SPI/ 3D Automated Optical Inspection, AOI) adopts the digital fringe projection technology to develop a fast and highly accurate 3D micro meter grade vision system. It can significantly improve the failure detection rate especially for false soldering in Surface Mounted Technology (SMT) process. The major innovations of the project are (1) shadow-free multiple projection system configuration; (2) multi-frequency fringe modulation; and (3) super fast multi-way phase integration.



3D/2D Defect Inspection

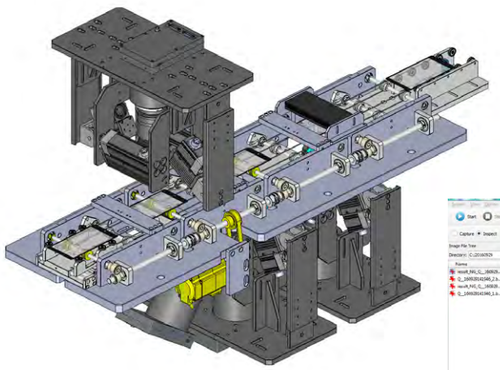
OE's 3D/2D defect inspection involves four essential enabling technologies: (1) Human eye bionic illumination technology which enables the light to be adjusted automatically with angle, size and topology structure according to the inspected object. It solves the long-standing machine adjustment problem caused by model switch during the manufacturing process; (2) Anti-glare image illumination/capture technology which solves the glare problem for image capturing and is very suitable for shinny surface and curved surface defects inspection; (3) High profile image processing algorithm which can detect low contrast defects image, handle noisy background image and extract high precision features; and (4) Machine learning defects perceptive algorithm which realises defects detection and recognition faster and in a more robust manner.

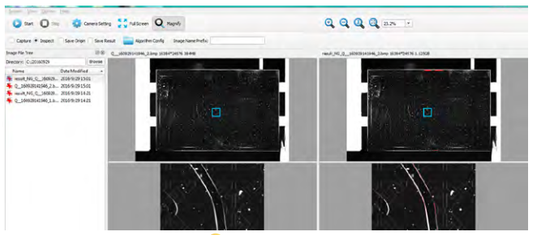
創新3D機器視覺

光電子科技部的3D機器視覺系統（3D錫膏檢測3DSPI/3D自動光學檢測3DAOI）是採用數字條紋投影技術開發的一種快速高精度3D微米級視覺系統。該系統可以在表面貼裝工藝（SMT）生產過程中高效地檢測瑕疵，提升品質，減低誤判率，特別是假焊檢測。該系統的主要特點包括：（1）100%無陰影的多投影系統；（2）多頻調製相位；（3）快速多相位整合算法。

3D和2D瑕疵檢測

光電子技術部的3D和2D瑕疵檢測包括四種必需的先決技術：（1）人眼仿生照明技術可以根據檢測物件的角度、大小和拓撲結構，自動調較光線。這項技術可以解決在製造過程中，因模式切換而需長時間調機的問題。（2）防眩影像照明/捕捉技術可以解決捕捉影像時的眩光問題，適合用作光亮表面和曲面的瑕疵檢測。（3）高階圖像處理算法可以捕捉對比度非常低的瑕疵，處理高噪聲背景圖像並分離出高精度的特徵。（4）機器學習的圖像認知算法能夠更快速更穩定地識別瑕疵。





2D/3D glass surface defect inspection
2D/3D 玻璃外觀瑕疵檢測

Holographic Projection System for See-through Displays

OE's holographic projection system is combined with proprietary Spatial Light Modulator (SLM), laser holographic projection engine and computer generated holographic (CGH). It creates a new approach to achieve high projection system efficiency, high contrast and low speckle effects, and can be widely applied to different kinds of see-through display applications including but not limited to head-up display (HUD), head-mounted display (HMD) and projection on surface (POS).

應用於穿透式顯示的全息投影系統

光電子科技部的全息投影系統由專有的相位調制器、雷射全息投影模組以及全息成像算法三個部份組成。此系統開創嶄新的方法以達至高效率的投影系統，高對比度以及低散斑效應等優點。系統可廣泛用於各種穿透顯示的應用，包括但不局限於抬頭顯示器，穿戴顯示器以及各種表面投影裝置。

Holographic Projection System for glass display
應用於投射玻璃的全息投影系統

Ultra Compact Miniature Projection System for Head-up Display (HUD)

OE's Intelligent Head-up Display can provide the driver with a see-through virtual display with a friendly gesture control and anti-fatigue warning function, while keeping the driver's eyes on the road. It uses ASTRI's compact optical projection design together with patent-protected sensing technology to achieve an ambient adaptive high quality virtual display, and an accurate driver-assistance sensing with low system power and production cost. This Intelligent Head-up Display has a built-in Android operating system. It can be linked to Internet of Vehicles (IoV) and becomes a perfect solution as part of the Advance Driver Assist Systems (ADAS).

應用於車載抬頭顯示器（HUD）的超微型投影系統

光電子科技部的智能抬頭顯示器能為司機提供透視虛擬顯示，配合方便使用的手勢控制和疲勞警報功能，讓司機的眼睛可以保持看著路面。這項技術應用了應科院的微型光學投影設計和專利感應技術，達至可適應周遭環境的高質虛擬顯示，並在低系統耗能和低生產成本下，提供精確的輔助駕駛傳感。這項智能抬頭顯示器內置Android操作系統，是一項用於輔助駕駛的完美解決方案，可與車聯網應用結合，成為智能輔駕系統的一部份。

Ultra Compact Miniature Projection System for Head-up Display (HUD)
應用於車載抬頭顯示器(HUD)的超微型投影系統

Sensing integrated compact module design for Head-mounted Display (HMD)
頭載型傳感一體式微型模組設計

Sensing Integrated Compact Module Design for Eye/ Face/Object Detection for Head-mounted Display (HMD)

OE's Head-mounted Display uses proprietary sensing integrated optics for both display and sensing. With its sensing capability, it recognises finger-touch sensing on air, pupil detection and tracking, and iris recognition. Furthermore, it helps to greatly simplify algorithms for eye-pupil tracking, finger tracking and touch detection. As there is a built-in Android embedded system, it is user-friendly for connection to any Internet of Things (IoT) system such as In-door navigation for different types of AR applications.

針對手、臉、物體進行檢測的頭載型傳感一體式微型模組設計

光電子科技部的頭載式顯示器採用專利並集感測及顯示於一體的光學模組，以實現空中虛擬觸控、眼球檢測追踪以及虹膜辨識等人機互動功能，並且有效簡化識別算法。顯示器內置Android系統，可以輕易連接至各類物聯網的系統，如利用室內定位系統進行各種擴增實境（AR）的應用。

ASTRI's Head-mounted Display (HMD) enables finger touch sensing on air
應科院頭戴式顯示設備實現手指虛擬觸控

Modules and Integration

Ageing population is a global phenomenon and people are becoming increasingly health-conscious. Responding to the growing demand for healthcare products and services, the Modules and Integratoin Group (MI) is focusing on developing different preventive healthcare technologies for the important market.

The Group's current technologies include arterial stiffness measurement, continual cuffless blood pressure monitoring, physiological and psychological condition monitoring, non-invasive blood glucose monitoring, and food safety and quality sensing.

- Cardiovascular Monitoring
- Cognitive Health Monitoring
- Blood Glucose Monitoring
- Food Safety and Quality Sensing

Cognitive Health Monitoring Device

A device to facilitate early detection and screening of elderly with cognitive health problems and to assess stress level of the general public is being developed. The device can be used for early detection and continuous monitoring of cognitive impairment to improve the experience and convenience of cognitive assessment for the elderly in Hong Kong.

模組與集成研發組

人口老化已是全球現象，而人們也越來越注重健康。有鑑於對保健產品和服務的需求日益增加，模組與集成研發組的核心技術針對這新興市場，主力研發各種預防的保健技術。

模組與集成研發組現有的技術包括動脈硬度測量、持續無袖帶血壓監測、生理和心理狀態監測、無創式血糖監測和食品安全與品質檢測。

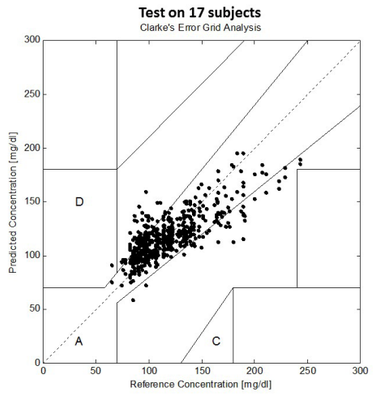
- 心血管監測
- 認知健康監測
- 血糖監測
- 食品安全與品質檢測

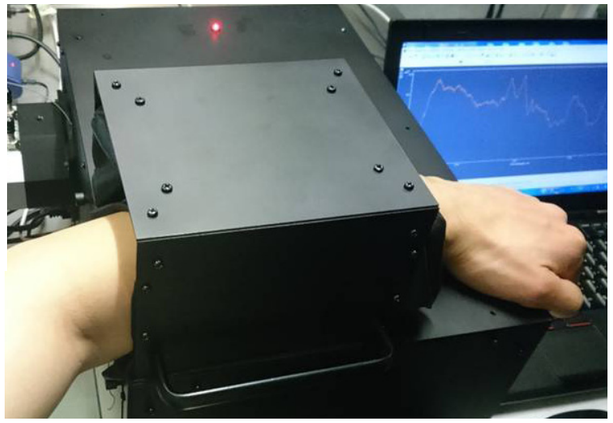
認知健康監測儀

應科院研發了能用作早期察覺和篩查長者認知問題，以及可評估普羅大眾之壓力水平的儀器。此儀器可以用作早期察覺和持續監測認知障礙，以及改善長者在香港接受認知評估的體驗和困難。

Non-invasive Blood Glucose Monitoring Device

A portable embedded optical device for non-invasive blood glucose measurement, which can be easily used to measure blood glucose instantly and non-invasively, is being developed. This device can be used for screening of pre-diabetes and for regular blood glucose measurement of diabetic patients.





ASTRI's Non-invasive Blood Glucose Monitoring Device
應科院無創式血糖監測儀

無創式血糖監測儀

我們研發出用作無創式血糖測量的可攜式嵌入光學儀，它可以即時簡易地無創測量血糖水平。此儀器可以用作早期糖尿病篩查，以及為糖尿病患者進行定期的血糖測量。

Cardiovascular Monitoring Device

A revolutionary cardiovascular monitoring device using smart sensor to measure blood pressure, arterial stiffness and heart rate at wrist has been developed. Unlike traditional cuff-based blood pressure metres, this new device does not block blood vessels during measurement and hence allows continual measurement. The measurement results can be conveniently uploaded to a central database through mobile devices or tele-care systems available in Hong Kong to facilitate health monitoring by medical professionals.

New design of the Cardiovascular Monitoring Device
心血管監測儀的改良設計

心血管監測儀

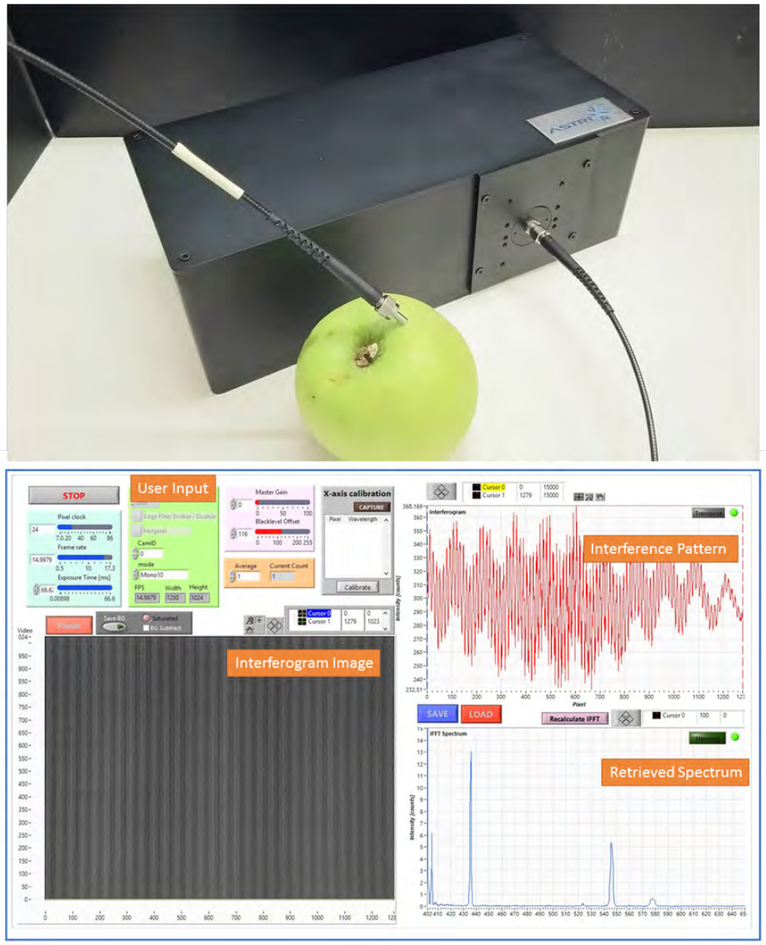
革命性的心血管監測儀使用新研發的智能感應器，可以在手腕位置監測血壓、動脈硬度和心跳率。與傳統的袖帶型血壓計不同，這個新儀器在測量時並不會阻塞血管，因此可以進行持續監測。測量結果可以透過適用於香港的遠程保健系統或移動裝置上載至中央數據庫，以便醫護人員進行健康監測。

Food Safety and Quality Screening Device

A compact optical module has been developed for on-site food safety and quality screening using spectroscopic methods. This module is based on static fourier transformation technology. It can overcome the intrinsic trade-off between the size and the performance in the conventional spectroscopic devices to fulfil on-site applications.

食品安全與品質篩查儀

應科院研發了用作於現場食品安全和品質篩查儀的小巧光學模塊。這個光學模塊採用靜態傅立葉變換分光技術，能解決傳統分光光譜儀器的規模與效能之間的限制，有利於作為現場篩選檢測的應用。



Food Safety and Quality Screening Device
食品安全與品質篩查儀

Collaborations

ASTRI-TRULY Joint Research and Development Centre

ASTRI has strengthened collaboration with TRULY International Holdings Limited (TRULY) by jointly setting up the ASTRI-TRULY Joint Research and Development Centre for accelerating professionalisation and commercialisation of new technologies.

TRULY's production facilities in Shanwei and Huizhou will also be engaged in the collaboration, covering various technology areas such as internet intelligent terminal, intelligence automobile, Industry 4.0, etc. With the establishment of ASTRI-TRULY Joint Research and Development Centre, a number of joint research projects will be launched, including the 'Industry Collaborative Project' programme. The two parties will join hands in setting up the state-of-the-art LCoS (Liquid Crystal on Silicon) Display Technology Joint Laboratory to develop head-up display (HUD) parts and technology.

The aim of this Joint Research and Development Centre is to develop a collaborative platform that can benefit both parties in the long run. Through this collaboration, both parties can leverage on each other's strengths - incorporating ASTRI's latest R&D technology and TRULY's manufacturing capacity. This can also facilitate a more integrated and professional strategic partnership development which is more synchronised than the previous format of project collaboration.

夥伴合作

應科院 - 信利聯合研發中心

應科院與信利國際有限公司（信利國際）進一步合作，共同成立「應科院 - 信利聯合研發中心」，加速科研技術的專業化、市場化和產業化。

信利汕尾和信利惠州兩大生產基地亦將參與是次合作，涵蓋互聯網智能終端、智能駕駛、工業4.0等多個相關技術領域。研發中心將展開多個科研合作項目，當中包括「業界合作項目」計劃，雙方將成立先進液晶覆硅顯示技術聯合實驗室，共同進行車載抬頭顯示器核心顯示部件和技術的研究。

成立此聯合研發中心旨在讓彼此建立一個長期互利共贏的合作平台，使應科院嶄新的研發技術和信利國際的精細生產製造力能完美結合，並促進雙方從以往單一科技研發項目的合作模式，邁向更專業綜合的戰略聯合發展。

Establishment of ASTRI - TRULY Joint Research and Development Centre
成立「應科院 - 信利聯合研發中心」

Project Highlights 重點研發項目

Project Name 研發項目	Duration 時期
Smart Compact 3D Machine Vision System 智能微型三維機器視覺系統	Dec 2013 – Jun 2015 2013年12月至2015年6月
Optical System for Health Assessment (Full) 用作健康評估的光學系統	Jan 2014 – Jan 2016 2014年1月至2016年1月
3D Pico Projector and Mobile Interactive I/O Devices* 三維微投影系統與便攜式互動I/O終端*	Aug 2014 – Mar 2016 2014年8月至2016年3月
Intelligent Wearable Information Display (IWID) 智能穿戴式顯示器	Mar 2015 – Aug 2016 2015年3月至2016年8月
Mood, Stress & Activity Tracking Devices 情緒、壓力與活動感應裝置	Apr 2015 – Sep 2016 2015年4月至2016年9月
Device for Cardiovascular Disease Risk Analysis 心血管疾病風險分析儀	May 2015 – Apr 2016 2015年5月至2016年4月
Cardio-Vascular Monitoring Devices for Tele-Care System* 用於遠程照顧的心血管監察儀*	Aug 2015 – Jan 2017 2015年8月至2017年1月
Compact Optical Module for Food Safety & Quality Screening 用作食品安全與品質篩查的小巧光學模塊	Sep 2015 – Sep 2016 2015年9月至2016年9月
Intelligent Visual Inspection Technology 智能視覺檢測技術	Oct 2015 – Jun 2017 2015年10月至2017年6月
Feasibility study on LCoS Phase Modulator for Automotive Holographic Head-up Display Application 對於可應用於車載全息擋頭顯示器的LCoS相位調制器的可行性研究	Mar 2016 – Mar 2017 2016年3月至2017年3月

*Public Sector Trial Scheme Project
*公營機構試用計劃項目

Security and Data Sciences

Overview

Security and Data Sciences Division (SNDS) focuses on network security, big data analytics and mobile computing. Other areas of interest include crypto-processor and communication and device development. Related projects are conducted by four Core Competence Groups, namely Cybersecurity, Data Analytics, Cloud Computing and Video Analytics, SNDS also runs the ASTRI-HPE Information Technology Research Centre (AHITRC) and ASTRI Security Lab (ASL).

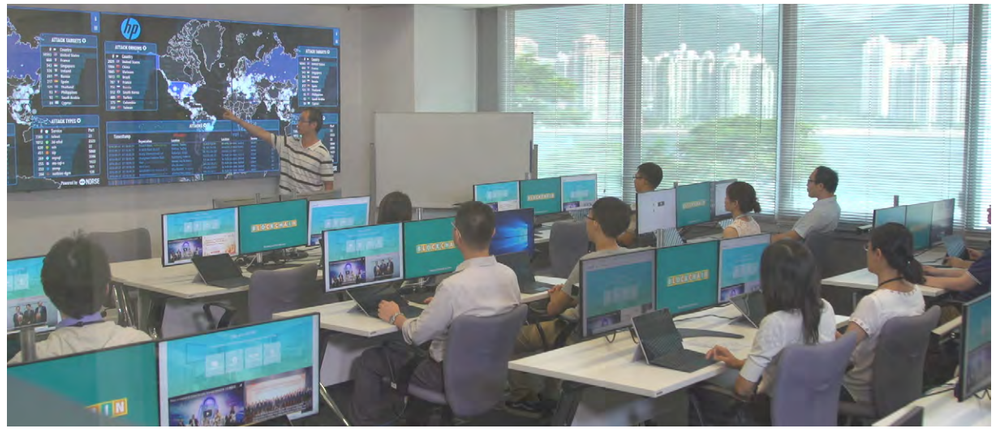
With continuous efforts from our cybersecurity experts, cloud computing and data analytics engineers and scientists, SNDS has successfully secured business deals on cybersecurity and big data analytics. The team is working to build a full-fledged cybersecurity information sharing platform and a state-of-the-art training facility for cybersecurity practitioners in law enforcement agencies and financial institutes. Besides, the Division also provides cyber-threat assessments and reviews, and mobile app quality and vulnerability assessments to the industry.

信息安全與數據科學

概況

信息安全與數據科學科技部專注於網絡安全、大數據分析及移動計算的研發。其他研發範疇包括密碼處理器和通訊與裝置發展。相關項目由四個研發小組進行，包括網絡安全、大數據分析、雲端計算和視頻分析。此外，還包括應科院-HPE資訊科技研究中心和應科院網絡安全研究所的研發工作。

在我們的網絡安全專家、雲端計算與數據分析工程師及科學家努力下，信息安全與數據科學科技部已成功簽署網絡安全和大數據分析的商業協議。此外，我們正努力為執法機構和金融機構的網絡安全從業員建立一個完善的網絡安全訊息共享平台和最先進的培訓設施。還有，科技部亦為業界提供網絡威脅評估和審查、移動應用程式質量和風險評估等服務。



SNDS is working to build a state-of-the-art training facility for cybersecurity practitioners in law enforcement agencies and financial institutions
信息安全與數據科學科技部正努力為執法機構和金融機構的網絡安全從業員建立最先進的培訓設施

Technology Focus and Services

Cybersecurity

Information security enables secure and reliable communication networks and systems and storage. Data encryption, network and system security, software security, authentication and identification, digital signature, cloud security, and secure data analytics are all key components

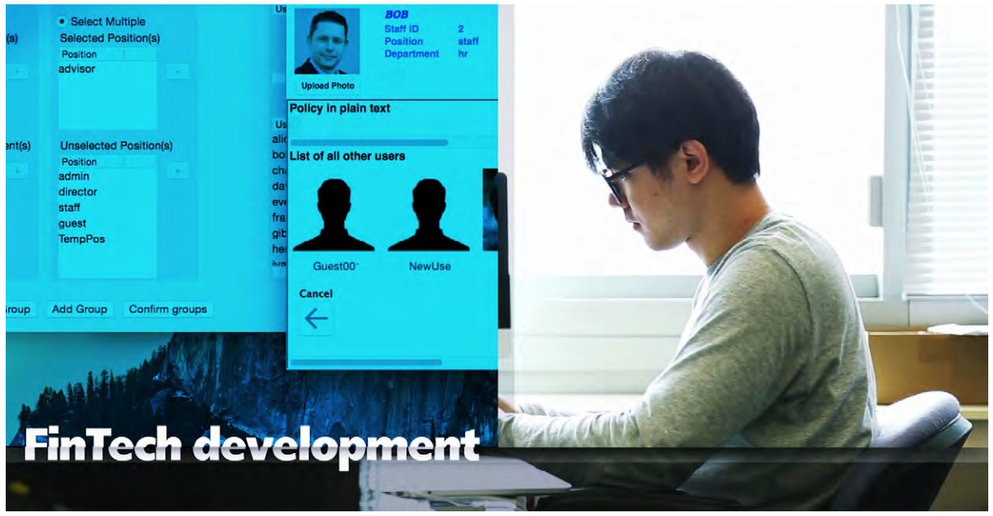
技術重點與服務

網絡安全

信息安全是安全可靠的通訊網絡、系統和存儲的先決技術。數據加密、網絡和系統安全、軟件安全、認證和識別、數碼簽署、雲端保安及安全數據分析等，全都是在網絡上保護數據和個人資料私隱的關鍵部份。

for protecting our data and the privacy of our personal information on the internet. Information security is also crucial for a sustainable and vibrant IT infrastructure and ICT development. SNDS's Cybersecurity Core Competence Group strives to develop innovative and advanced security technologies, and provides industry-standard security solutions. It nurtures cybersecurity talents to enhance privacy protection for the society.

信息安全對持續及蓬勃的資訊科技基建和資訊及通訊科技發展均是非常重要。網絡安全研發組致力研發創新及世界頂尖的網絡安全技術，並提供符合業界標準的安全解決方案，更致力培育網絡安全人才，令他們可以為社會在保障私隱方面作出貢獻。



One of the core focus for the Group is security research related to the banking industry. For instance, the Group has developed an Attribute Based Encryption (ABE) application to enable data encryption based on the decryptor's attribute, rather than having to encrypt data individually for each decryptor. Besides, the Group reviews software and hardware from major banks. The Group discovered a few zero-day vulnerabilities in a router commonly used in banks and has alerted the vendors accordingly. The Group also studied encryption models and cracking methods against famous ransomwares such as Locky and CryptoWall. Details about the ransomwares and decryption methods are shared to the subscribers through ASTRI Security Lab Cyber Intelligence (ASLintel), a cybersecurity news posting platform developed by the Group, and for affected parties to refer to.

ASLintel was developed by the Group last year. Subscribed users have access to daily security-related news update, generated automatically by the system. The Group also writes monthly summaries and attack case analysis on recent incidents. Shortly after the July'16 ATM heist in Taiwan, the Group compiled a report detailing the affected ATM's model and analysed the hackers' operandi for subscribing banks' reference. With this platform, users can gather organised information on the latest attacks and react accordingly. Current subscribed users include OGCIO, Hong Kong Police Force and several commercial banks.

而研發小組其中的一個重點是進行與銀行業相關的信息安全研究。例如，該研發組已研發出基於屬性加密（ABE）的應用程式，使加密器可根據解密者的屬性進行加密，而不須分別為每個解密者加密。此外，研發組會審查各大銀行的軟件和硬件。研發小組曾經發現一個在銀行普遍使用的路由器中竟然帶有一些零日漏洞，於是向各供應商報告。研發組也致力研究加密模式和破解不同勒索軟件的方法如Locky和CryptoWall。有關勒索軟件和解密方法的詳細資訊會在研發組所開發的應科院網絡安全情報站（ASLintel）中與訂閱用戶分享。

研發組於去年開發ASLintel。訂閱用戶每日會獲得由系統自動發放關於網絡安全的資訊。研發組也會就最近發生的事件進行分析和撰寫每月簡要報告。例如，2016年7月於台灣發生的櫃員機盜領案，研發組分析和整合了受影響的櫃員機型號、匪徒的犯案手法和預防方法，並將資料總結成報告上傳到網絡安全情報站，供訂閱的銀行用戶參考，從而作出防範。透過這平台，用戶可以收集最新的網絡攻擊資訊，並作出應對。目前訂閱用戶包括政府資訊科技總監辦公室、香港警務處與數家商業銀行。

The Group is now working on a Threat Intelligence Sharing Platform for the banking industry in Hong Kong where certain data, information, and cybersecurity intelligence provided by the contributing authorised users of the platform can be collected, compiled, and shared. The purpose of the platform is to enable timely information sharing to allow spontaneous and appropriate precautionary measures to be taken in combating cyber-attacks.

研發組現正為香港銀行業建立網絡安全訊息共享平台，用戶除了能收到網絡安全情報外，更可將其收集到的資訊上傳，分享給其他授權用戶。平台旨在適時分享資訊，使用戶能接收到情報時能及時採取適當的預防措施，對抗網絡攻擊。

To cope with the ever-changing cybersecurity threats to critical infrastructure and financial stability of Hong Kong, the research and development of a Cyber-threat Intelligence Platform lays the foundation for Cybersecurity Intelligence Exchange among critical infrastructure entities e.g. the banking industry, public utilities, and public IT infrastructure. Upon being developed, it will be a core technology supporting the cybersecurity intelligence exchange between banks or even the entire critical IT infrastructure of Hong Kong. The system will be crucial in supporting trusted intelligence exchange among banks and can be extended to support other stakeholders in future.

為應對瞬息萬變的網絡安全威脅以維持香港關鍵基礎設施和金融的穩定，網絡安全訊息共享平台的研究將有助銀行業、公共設施和公共資訊科技設施等關鍵的設施在其界別的組群內分享網絡安全情報。當這些平台建好後，將會成為核心技術以支援銀行業，甚至有助整個香港的資訊科技基礎設施之間進行網絡安全情報交流。該系統對支援銀行之間的情報交流將會非常重要，系統並可在未來進一步發展，支援其他持份者。

Data Analytics

The Data Analytics Core Competence Group focuses on the development and application of big data analytics platform and algorithms for various domain applications in retail, marketing, FinTech and security. The Group collaborates with university teachers in algorithm research such as natural language processing and sentiment analysis. On domain applications, the Group collaborates with industrial partners in utilising and customising our technologies into their products and domain applications. For example, the Group partnered with a local logistics solution provider in an Industry Collaborative Project to develop a real-time product recommendation system for smart tray in retail shop. New recommendation algorithms are designed to take into account the user behavioural data collected from smart tray activities in the shop. The Group built a topics identification and classification system for an Asian start-up news aggregator to minimise the deployment of human resources in performing such daily tasks manually. The Group also explores the application of big data analytics and machine learning in social network analysis, e-learning analytics and security analytics.

大數據分析

大數據分析研發組專注於大數據分析平台和算法的開發及應用。目前主要應用在零售、市場營銷、金融科技和保安的領域上。研發組跟大學教授合作進行算法研究，例如自然語言處理和情感分析。在技術應用方面，研發組與業界夥伴合作，把我們的技術整合並應用到他們的產品和應用中。例如，技術組跟本地物流界的技術方案供應商在一個業界合作項目上，開發一個應用在零售店的智能托盤實時產品推薦系統。技術組需要考慮到從店裡智能托盤收集到的用戶行為數據來設計新的推薦算法。技術組也為本地一家亞洲初創新聞資訊公司，研發自動化主題識別和分類系統，以減少人手執行這類日常工作。技術組亦研究大數據分析和機器學習在社交網絡分析、電子學習分析和保安分析上的應用。

Cloud Computing

The SNDS-CLOUD Core Competence Group focuses on research of genetic algorithm (GA) and cryptographic biometrics recognition algorithm, and development of big data open platform and efficient, scalable and highperformance cloud computational engine. This open platform is not limited to giving exclusive solutions or developing isolated applications. Instead, it is open to all parties and will further foster innovations that can benefit end-users and the society at large. So far, we have already provided a number of big data products and applications, including an open quant cloud platform for Internet finance, remote cryptographic biometrics authentication for cloud applications, biometrics ticketing and so on.

The ongoing research of GA will help to provide services to the financial sector. Based on cloud computational engine, big data platform and artificial intelligence technology, the computer will learn how to process complex events. As a result, it will help traders and agencies to automatically generate trading strategies and advise on selecting of the best one.

雲端計算

雲端計算研發組專注研究遺傳算法和可加密的生物認證識別法；同時又開發開放式大數據處理平台和高效可擴展、高性能的雲端計算引擎。我們的開放式平台，不僅局限於提供單一的解決方案或只能開發單一應用，而是公開予所有人，促進更多創新技術發展，從而惠及終端用戶以至整個社會。我們已為合作夥伴提供了多種大數據產品和應用，包括量化投資交易雲端平台、遠程指紋授權應用、以指紋和面部識別認證的電子票據應用等。

小組現正進行遺傳算法的研究，並將為金融業提供服務。此算法基於雲端計算引擎、大數據處理平台，以及人工智能技術，使電腦學習如何處理複雜運算，為幫助交易商和代理機構自動制定交易策略和提供建議，從而作出明智的選擇。

Collaborations

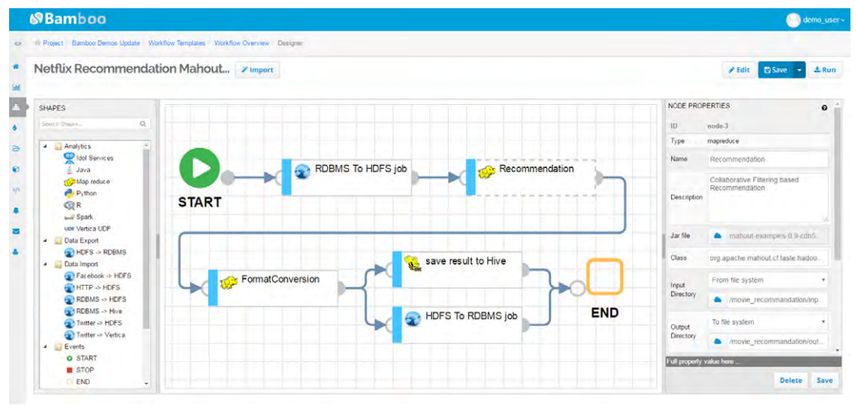
ASTRI – HPE Information Technology Research Centre (AHITRC)

Collaborating with Hewlett Packard Enterprise (HPE), AHITRC works on a bamboo project which aims to provide an easy-to-use Big Data Analytics (BDA) platform for both technical and nontechnical enterprise users. The developed platform has been successfully announced to the market on 18 March 2016, at the ASTRI-HPE joint conference 'Big Data and Analytics for Smart City'. On top of the developed platform, the team has successfully done a trial solution for smart traffic analysis, by correlating the information across multiple system to analyse Hong Kong traffic status, the weather impact to traffic as well as real-time prediction of traffic status in the coming hour. The team also works on real time streaming data analytics platform with specially designed analytics algorithms to support industrial systems monitoring, problem detection, root cause analysis, predictive maintenance etc.

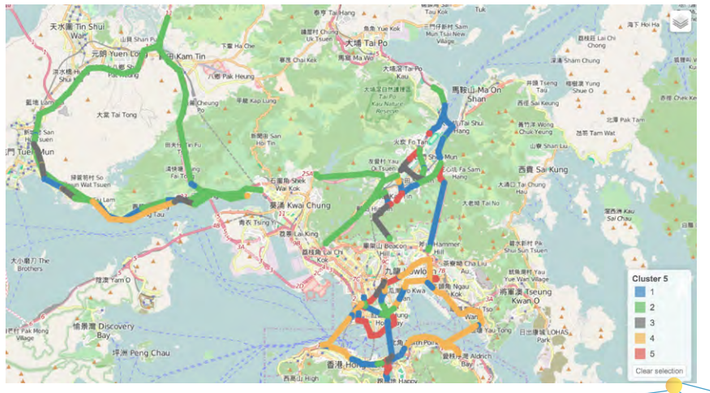
夥伴合作

應科院－HPE資訊科技研究中心 (AHITRC)

AHITRC與Hewlett Packard Enterprise (HPE)合作，致力研發大數據分析平台的技術，旨在提供一個端到端，簡單易用的大數據分析和管理平台，使非技術人員及技術人員可以對大數據進行分析。應科院與HPE在2016年3月18日舉行題為「智能城市的大數據和分析」的聯合會議上宣布把這共同研發的平台推出市場。在該平台之上，AHITRC團隊成功完成智能交通分析的試驗方案，把多個政府部門的數據進行分析和聯繫起來，以了解香港的交通狀況，天氣對交通狀況的影響，並提供未來一小時的實時交通狀況預測。團隊還致力研發實時串流數據分析平台，通過特定的分析算法，支援工業系統的實時監測、故障檢測和出錯之成因分析、預測性的維修保養等。



An easy-to-use Big Data Analytics (BDA) platform for both technical and nontechnical enterprise users
為非技術人員及技術人員提供簡單易用的大數據分析和管理平台



Data Analytics for Smart City - Smart Traffic
智慧城市數據分析 - 智能交通

Project Highlights 重點研發項目

Project Name 研發項目	Duration 時期
Fine-grained Access Control for Secure Cloud Storage via Attribute-based Encryption 通過基於屬性加密的安全雲端儲存細粒度訪問控制	Mar 2015 – Feb 2016 2015年3月至2016年2月
Search over Encrypted Documents on Cloud 雲端加密文件搜索系統	Jun 2015 – Mar 2016 2015年6月至2016年3月
Unified Streaming Big Data Analytics Platform 統一串流大數據分析平台	Jun 2015 – Mar 2016 2015年6月至2016年3月
VM Security in Infrastructure-as-a-Service (IaaS) 基礎設施即服務上虛擬機器的保安方案	Jun 2015 – Mar 2016 2015年6月至2016年3月
CyberSecurity Information Sharing Platform (SecShare) 網絡安全資訊共享平台	Jul 2015 – Mar 2016 2015年7月至2016年3月
Intelligent Software Defect Detection Technology 智能軟件瑕疵檢測技術	Sep 2015 – Mar 2016 2015年9月至2016年3月
Open Quant Cloud for Internet Finance 互聯網金融的開放式量化雲平台	Sep 2015 – Mar 2016 2015年9月至2016年3月
Bamboo: A Big Data Analytics Platform Bamboo: 大數據分析解決平台	Nov 2013 – May 2016 2013年11月至2016年5月
Cryptographic Biometrics as Personal Security and Access Technology 針對個人安全和接入的生物識別加密技術	Mar 2015 – Jun 2016 2015年3月至2016年6月
LTE Wireless Broadband Applications for Smart Transportation and Public Safety LTE無線寬帶智能交通和公共安全應用	Feb 2015 – Jan 2017 2015年2月至2017年1月
eLearning Analytics 電子學習數據分析	Jan 2015 – Jan 2017 2015年1月至2017年1月
Data Analytics Platform for Luxury Jewellery and Fashion Brands 針對豪華珠寶和時尚品牌的數據分析平台	Mar 2015 – Sep 2016 2015年3月至2016年9月
Complex Event Computation System and Platform for Uncertain Data 複雜事件計算和處理平臺	Jan 2016 – Jul 2017 2016年1月至2017年7月
Cyber Security Research & Practice Platform or Financial Services 財經服務的網絡安全研究和實習平台	Jan 2016 – Jun 2017 2016年1月至2017年6月
Mobile Business Assistant 移動商務助理	Mar 2016 – Aug 2017 2016年3月至2017年8月

Software and Systems

Overview

Software and Systems Division (SNS) strives to build on Hong Kong's core competences in three technology areas for developing intelligent software-based system solutions to facilitate decision-making of individuals as well as the holistic operation of our environment. The three technology areas are Mobile and IoT platforms, Multimedia Systems and Analytics, and Intelligent Cognitive Systems.

On the technology front, (SNS) has acquired relevant domain knowledge and developed systems and applications for smart cities, next generation networks, medical and health, and financial services. SNS will continue its research and development endeavours within the scope of industry technology trends such as physical web, seamless indoor and outdoor geo-spatial information system, deep learning computer vision, multi-modal biometrics, intelligent data analysis and management, as well as cognitive computing.

Technology Focus and Services

With respect to the technology areas, corresponding Core Competence Groups are established under SNS. Each group focuses on a particular technology area and relevant software-based system solutions.

軟件與系統

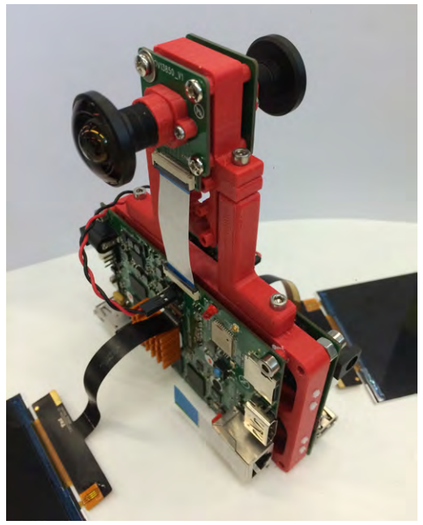
概況

軟件與系統科技部致力建設香港在三項技術領域的核心競爭力，以開發智能軟件系統的解決方案，從而促進個人決策，以及環境的整體運作。這三項技術領域包括：移動和物聯網平台、多媒體系統及分析，以及智能認知系統。

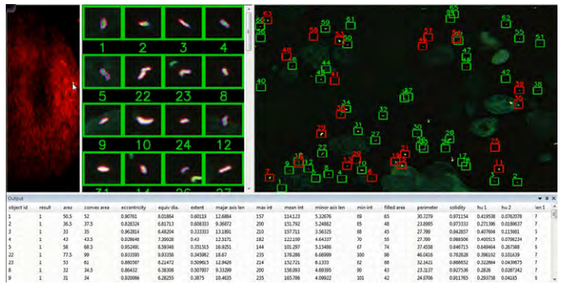
在技術領域上，科技部已擁有相關的專才，並開發智慧城市、新一代網絡、醫療健康和金融服務等系統和應用。科技部將繼續按業界科技趨勢進行研發，如物理網絡、無縫室內和室外地理空間信息系統、電腦視覺深度學習、多模態生物特徵識別、智能數據分析和管理，以及人工智能認知計算。

技術重點與服務

軟件與系統科技部成立相應的研發小組，專注開發特定技術領域和相關的軟件系統解決方案。



Panorama camera prototype
全景相機原型



Automated tuberculosis smear screening system for dual imaging modes with real-time focusing, digital image capturing and algorithm for TB diagnosis and grading
支持實時對焦、數字圖像採集、肺結核診斷和評級算法的自動化雙圖像模式肺結核切片篩查系統

Mobile and IoT Platforms

The Mobile and IoT Platforms Group focuses on developing technologies to tackle the scalability problem of IoT systems for large-scale deployment. The client-server architecture should be able to accommodate vast amount of network traffic triggered by millions of devices and mobile users, while at the same time function cohesively with the cloud resources which can scale horizontally instead of vertically. In addition, the Group also works on the proximity, geographic information and real time telemetric-related technologies such as positioning, map rendering, sensors data processing, and smart navigation, etc.

移動和物聯網平台

移動和物聯網平台研發組專注於開發新技術，令物聯網系統得以大規模地鋪設。而這些客戶端伺服器體系結構方面，亦需能容納由數以百萬計設備和移動用戶所產生的大量網絡傳輸；同時，這些設備的功能必須可與雲計算資源融合運作，並可橫向式擴展。此外，該研發組還研發地理信息和實時遙測相關技術，如定位、地圖算繪、傳感器數據處理、智能導航等。

Multimedia Systems and Analytics

多媒體系統及分析

Head-mounted display hardware prototype
頭戴式顯示器硬件原型

The Multimedia Systems and Analytics Group focuses on developing innovative visual computing and embedded system technologies for a wide range of applications. In addition to signal processing-based image analysis, the Group employs big data and deep learning tools to tackle large-scale challenging problems in computer vision, from medical image analysis to surveillance video abnormal scene detection. The Group has also developed expertise in optimising embedded systems in terms of performance, accuracy, speed, form factor, as well as power consumption for highly specialised systems from miniaturised video laryngoscope to virtual reality head-mounted display.

多媒體系統及分析研發組專注開發適用於廣泛應用的創新視覺計算和嵌入式系統技術。除了採用訊號處理進行圖像分析，研發組還採用大數據和深入學習工具來解決大規模具挑戰性的視覺計算問題，從醫學圖像分析以至監控錄像異常場景檢測。研發組亦具備專業的技術，可優化嵌入式系統的性能、精準度、速度、外型，及功耗等方面；以提升一些高度專門的系統，如微型視頻喉鏡、虛擬現實頭戴式顯示器等的性能表現。

Intelligent Cognitive Systems

The Intelligent Cognitive Systems Group focuses on developing machine learning and user experience technologies, and scalable solutions for smart systems, with realisation platforms ranging from embedded system to distributed cloud environments. In particular, the Group has developed expertise in handwriting image recognition and 3D motion data analysis. This is in consideration of the fact that advanced sensor-based natural user interface is key to an effective solution, and the Group strives to develop solutions that are user-friendly and can be operated intuitively.

智能認知系統

智能認知系統研發組重點開發機器學習和用戶體驗的技術，以及實現可擴展的智能系統解決方案。實現平台包括嵌入式系統到分布式雲計算環境。研發小組考慮到置有先進傳感器的自然用戶界面在智能認知方面十分有效，而研發小組亦一直致力開發易用而操作簡便的解決方案，因此研發小組特別在手寫文字圖像識別和3D運動/動作數據分析這方面不斷進深。

Applications and Innovation

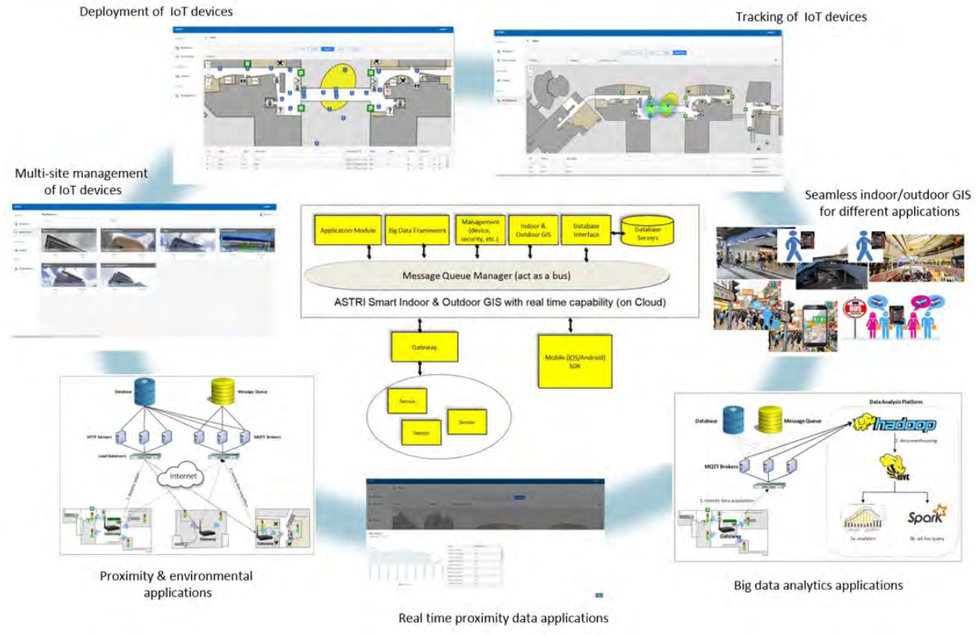
技術應用及創新

Smart City and Next Generation Network

The development of Smart City systems involves populating Internet of Things (IoT) devices on a large scale. In order for these devices to be useful, the geographic information and time stamps of these devices are needed by the associated applications. To achieve such a vision, an underlying software infrastructure is required to support the actual implementation.

智慧城市和新一代網絡

要發展智慧城市系統，必須大規模裝置物聯網設備。而要令這些設備實用，必須將之連到配備地理資訊及時間標記的相關軟件應用程式，因此建構深層的軟件基礎設施對實現智慧城市尤為重要。



The Smart City Platform
智慧城市平台

The Mobile and IoT Platforms Group has developed a Real Time Location Proximity Data System Platform for smart city applications. This platform provides seamless indoor and outdoor geographic information, time stamps, real time data capturing and monitoring, smart navigation, and big data analysis for IoT devices. At the same time, the system can accommodate the scalability issue due to massive connections. Underlying the system is a horizontal scalable server software stack and a mobile SDK (Software Development Kit) for developing total solutions and deployment of large-scale enterprise and consumer-grade smart city applications and systems.

移動和物聯網平台研發組已研發實時定位數據系統平台，以應用於智慧城市。該平台提供了無縫的室內室外地理信息、時間標記、實時數據採集和監控、智能導航、以及用於物聯網設備的大數據分析。同時，系統可應付由於大規模網絡連接所引起的可擴展性問題。系統的背後是可橫向擴展的服務器軟件和軟件開發套件（SDK），可用作開發智慧城市的整體解決方案及相關大型企業和為消費者而設的應用程式和系統。

Health hub for healthcare professionals
供護理員使用的電子健康測量系統

Medical and Health

The Multimedia Systems and Analytics Group has developed multiple diagnostic imaging systems for both pathology and endoscopy diagnoses, including a high-speed medical slide scanner, a tuberculosis smear auto screener, a video laryngoscope with Wi-Fi streaming, and a gastroscope designed with disposable insertion modules. In the area of patient and elderly healthcare, the Group has developed tele-health solutions which enable biometric data to be easily captured and analysed.

醫療健康

多媒體系統和分析研發組已研發為病理學及內鏡診斷而設的多種診斷成像系統，當中功能包括高速醫療幻燈片掃描儀、肺結核塗片自動篩選、具有Wi-Fi串流媒體視頻喉鏡，配備一次性插入模塊的胃鏡。在病人和長者醫療保健領域，研發組還開發了遠程醫療解決方案，能更容易收集病人生物特徵數據並加以進行分析。

Infotainment and Multimedia

The Multimedia Systems and Analytics Group has developed multimedia consumer electronics systems including set top box, video streaming dongle, panoramic camera, and head-mounted display. The Group is currently developing an end-to-end panoramic video generation, management, and viewing system which will have extensive application in different industries.

信息娛樂和多媒體

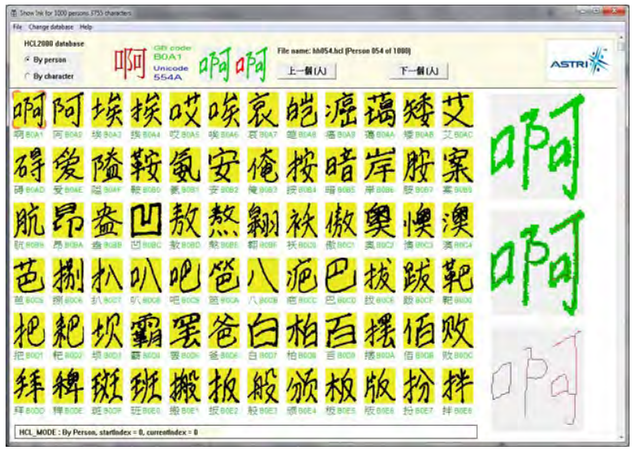
多媒體系統和分析研發組已經開發了多媒體消費電子系統，包括機頂盒、視頻串流加密鎖、全景攝像鏡，及頭戴式顯示器。目前該組正在開發適用於不同行業並具廣泛應用的端至端全景視頻合成、管理和觀察系統。

Financial Services

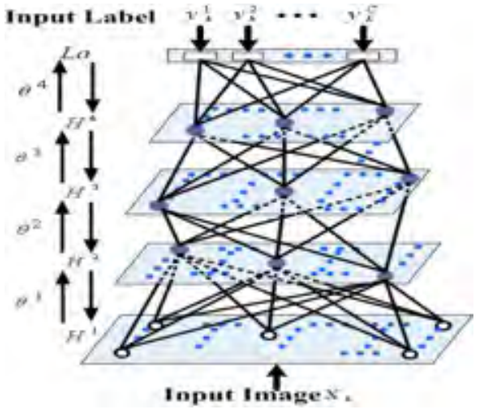
The Intelligent Cognitive Systems Group has developed a Chinese handwriting image recognition system that can improve the efficiency and effectiveness of hand-written forms processing which is posing a heavy burden on financial institutions and government departments. In addition, the Multimedia Systems and Analytics Group is developing multi-factor behavioural biometrics modules including facial, voice, and touch data fusion for mobile banking user authentication.

金融服務

智能認知系統研發組已開發中文手寫影像識別系統，這項技術可以提升手寫文件處理效率，以紓緩金融機構和政府部門在處理手寫文件方面的沉重負擔。此外，多媒體系統和分析研發組現正開發多因子行為特徵偵測模塊，包括面部辨認、聲音辨識和觸摸數據融合，以作銀行手機用戶認證。



Machine learning for
Chinese handwriting recognition
中文手寫影像之機器學習



Deep Learning technology for continuous learning
以深度學習技術作持續學習

Project Highlights 重點研發項目

Project Name 研發項目	Duration 時期
Internet of Things (IoT) via BLE Application and System 物聯網:低功耗藍牙應用和系統	Jab 2015 – Jun 2016 2015年1月至2016年6月
Telehealth Technology Platform (Hybrid Tracking System for Enhancing Elderly Caring Service)* 遠距健康照護技術平台 （混合跟踪系統以加強長者關愛服務）*	Nov 2014 – Apr 2016 2014年11月至2016年4月
Intelligent Distributed Mobile Computing-OS Technology 智能分佈式移動計算-操作系統技術	Mar 2015 – Mar 2017 2015年3月至2017年3月
Low Cost, Miniature Handheld Smart Video Scope Technology 手持微型高清監視儀技術	Jun 2015 – Dec 2016 2015年6月至2016年12月
Medical Image Data Analytics Platform 醫學圖像數據分析平臺	Feb 2016 – Jul 2017 2016年2月至2017年7月
Mobile Multimedia Processing with Enhanced Quality of Experience 增強用戶體驗的移動多媒體處理	Mar 2016 – Mar 2017 2016年3月至2017年3月
Chinese Handwriting Recognition from Scanned Form 從表格掃瞄圖像中識別手寫中文的技術	Nov 2015 – Aug 2016 2015年11月至2016年8月
Elderly Healthcare Solution Platform 長者醫療保健解決方案平台	Jun 2014 – Jul 2015 2014年6月至2015年7月

*Public Sector Trial Scheme Project
*公營機構試用計劃項目

Community Engagement 接觸不同社群

ASTRI extends warm welcome to East Asia-Pacific Central Banks delegates for visiting ASTRI
應科院熱烈歡迎東亞及太平洋地區中央銀行代表團造訪應科院

Reaching Out to the Community

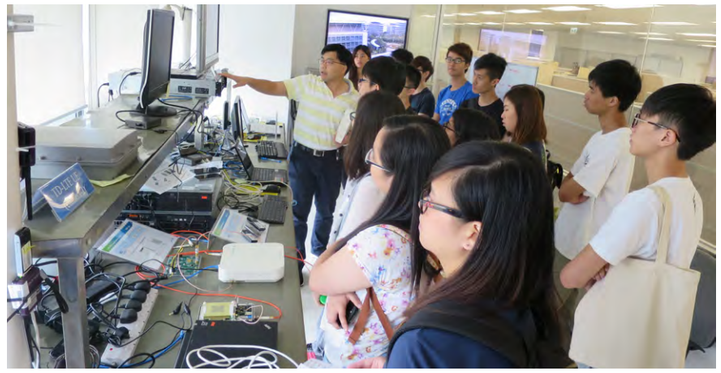
Staying committed to its social responsibility, ASTRI organises visits, seminars and outreach events to promote its latest technological achievements and its contributions to the community.

Throughout last year, ASTRI hosted 84 visits and received visitors from the government, industry and community, including students from universities and secondary schools. To facilitate knowledge sharing and forge close ties with different stakeholders, a total of 62 seminars and workshops were organised. ASTRI's R&D experts also took part in a number of conferences as guest speakers or panellists to share their expertise and insights. We also played host and rendered support to industry events that promote innovation and technology.

聯繫社區

應科院致力履行企業公民責任，並透過讓不同團體參觀應科院及舉辦研討會和不同類型的外展活動以宣傳其最新的技術、貢獻和成就。

回顧過去一年，應科院共接待了84團來自政府、業界和社區的訪客。當中包括本地的大學生和中學生。為促進知識共享並與各持份者建立密切聯繫，應科院共舉行了62場研討會和工作坊。應科院研發專家亦積極參加不同的會議，擔任主講嘉賓或專題討論的講者，分享他們的專業知識和見解。我們還舉辦並支持業界有關促進創新和科技的活動。



R&D expert introduces ASTRI's latest technologies to the university students
科研專才向大學生介紹應科院最新的科技

Making Good Use of Social Media

ASTRI has maintained its momentum in communicating with the online community through its YouTube channel and its Facebook fan page. As at 31 March 2016, a total of 5,462 fans have subscribed to ASTRI's Facebook fan page to keep track of our posts and to take part in discussions. On the other hand, a number of videos have been launched on YouTube to showcase our major events, latest technologies and achievements.

善用社交媒體

應科院亦透過網上平台，包括其YouTube頻道及公司的Facebook專頁，與社區內不同持份者保持溝通和聯繫。截至2016年3月31日止，共有5,462名用戶對應科院的Facebook專頁讚好，並緊隨應科院的最新消息及參與討論。另一方面，我們在YouTube推出了不同的視頻影片，展示主要活動、最新科技和取得的成就。

Dr Frank Tong (5th from right), Chief Executive Officer of ASTRI extends warm welcome to Dr Duoxiang Wang, Dean of Beijing Institute of Collaborative Innovation (4th from left), Ms Aoshuang Yan, Director of Beijing Municipal Science & Technology Commission (6th from the right) and a group of Beijing Haidian District Government officials for visiting ASTRI
應科院行政總裁湯復基博士（右五）熱烈歡迎北京協同創新研究院院長王蓼祥博士（左四）及北京市科委主任閻傲霜女士（右六）和一眾北京市海澱區政府官員到訪應科院

Dr Frank Tong (1st from right), Chief Executive Officer of ASTRI shares his expertise and insights at the Economist Event - Innovation Awards & Summit 2015
應科院行政總裁湯復基博士（右一）於《經濟學人》的活動「2015年創新獎及峰會」中分享真知灼見

Dr Meikei Ieong, Chief Technology Officer of ASTRI delivers a presentation on 'Enabling technologies for IoT and Smart Cities' at the Asia Pacific Radio Spectrum Conference 2016
應科院首席科技總監楊美基博士於2016年亞太地區無線電頻譜研討會中發表題為「適用於物聯網和智慧城市的應用科技」的演說

Highlights of the Year 年度焦點

Dr Frank Tong (right), Chief Executive Officer of ASTRI and Mr Li Zezhong, General Manager of Guangdong Rising Assests Management Co. Ltd exchange a warm hand shake after signing the agreement
應科院行政總裁湯復基博士（右）及廣晟總經理李澤中先生（左）代表雙方簽約後握手互賀

Mr Matthew Man (left), Chief Executive Officer of Megasoft Limited and Dr Frank Tong (right), Chief Executive Officer of ASTRI, sign the agreement on behalf of the respective companies
萬信電子行政總裁文振聲先生(左)與應科院行政總裁湯復基博士(右)代表雙方簽署合作協議

23/4/2015

ASTRI and Guangdong Rising Collaborate on Integrated Power Module and New Technology Research

應科院與廣東省廣晟合作研發集成電源模塊及電子通訊新技術

ASTRI collaborated with state-owned Guangdong Rising Assets Management Co. Ltd to jointly develop a next generation Integrated Power Module (IPM) and other new technologies for electronic and communication products.

應科院與國有企業廣東省廣晟資產經營有限公司（廣晟）合作，共同開發新一代集成電源模塊及其他電子和通訊新技術。

4/5/2015

ASTRI and Megasoft Limited Join Hands to Launch an Industry Collaborative Project

應科院及萬信電子科技有限公司攜手參與業界合作項目

ASTRI and Megasoft Limited signed an agreement to officially kick-start their partnership on an Industry Collaborative Project (ICP). It aims to develop a big data analytics platform for luxury jewellery and fashion brands.

應科院與萬信電子科技有限公司展開一項業界合作項目，共同開發專門針對珠寶及時裝零售的大數據分析平台。

ASTRI launches ASTRI Security Lab as FinTech Cybersecurity Platform
應科院舉行應科院網絡安全研究所啟動儀式

5/5/2015

ASTRI Security Lab Launched as FinTech Cybersecurity Platform

應科院舉行應科院網絡安全研究所啟動儀式

ASTRI hosted the ASTRI Security Lab launching ceremony at the InnoCentre to introduce its new cybersecurity platform and to invite the financial industry to join its FinTech alliance against cyber-attacks.

應科院於創新中心舉行「應科院網絡安全研究所啟動儀式」，介紹應科院最新成立的網絡安全平台，並邀請金融財經界加入金融科技聯盟，共同應對網絡攻擊。

1/6/2015

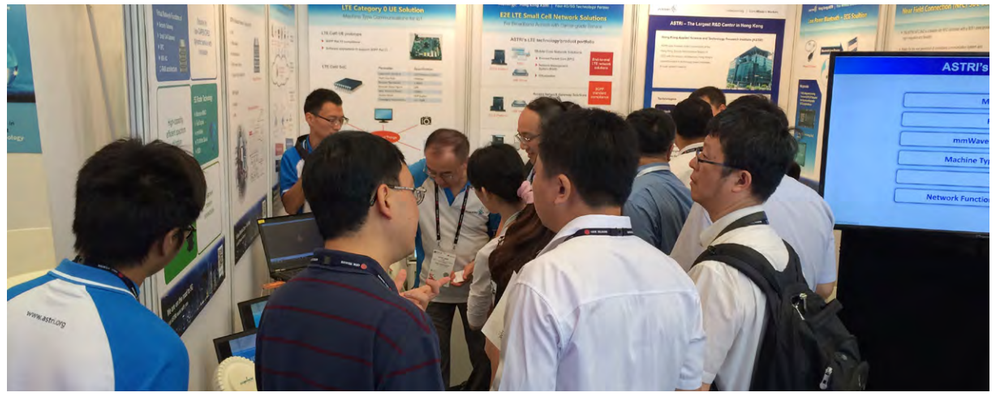
ASTRI Strengthens Collaboration with TRULY to Accelerate Commercialisation of New Technologies

應科院與信利國際進一步合作加速新型科技產業化

ASTRI strengthened collaboration with TRULY International Holdings Limited (TRULY) by jointly setting up the ASTRI-TRULY Joint Research and Development Centre for accelerating professionalisation and commercialisation of new technologies.

應科院與信利國際有限公司（信利國際）進一步合作，共同成立「應科院 - 信利聯合研發中心」，加速科研技術的專業化、市場化和產業化。

Guests officiate at the opening ceremony of ASTRI-TRULY Joint Research and Development Centre
應科院及信利國際有限公司雙方代表與一眾嘉賓主持「應科院 - 信利聯合研發中心」啟動儀式



ASTRI jointly demonstrates a series of new technologies and solutions on next generation network with industry partners including Keysight and Fujian Sunnada at Mobile World Congress Shanghai 2015
應科院於2015年世界移動通訊大會 - 上海與業界合作夥伴包括是德科技、福建三元達，共同演示新一代網絡嶄新技術和方案

14/7/2015

ASTRI Jointly Demonstrates a Series of New Technologies and Solutions on Next Generation Network with Industry Partners at Mobile World Congress Shanghai 2015

應科院於2015年世界移動通訊大會 - 上海與業界共同演示一系列新一代網絡嶄新技術和方案

ASTRI collaborated with key industry leaders to perform a series of live demonstrations of new technologies and solutions on next generation network at the Mobile World Congress Shanghai 2015, China, including:

- Brand new LTE Category 0 UE solution for Machine Type Communications (MTC) with the Keysight MXG vector signal generator
- End-to-end LTE small cell network solution of Fujian Sunnada Communication Co. Ltd. powered by ASTRI's latest LTE technologies

應科院與龍頭企業於2015年世界移動通訊大會 - 上海共同合作，演示和展示一系列新一代網絡的嶄新技術和方案，包括：

- 利用是德科技有限公司 （Keysight）的MXG矢量訊號產生器，演示全新的機器類型通訊的LTE Category 0 用戶終端 （UE） 解決方案
- 演示基於應科院最新LTE技術的福建三元達通訊股份有限公司的端到端LTE小型基站網絡解決方案

Mobile World Congress Shanghai 2015
2015年世界移動通訊大會 - 上海

Mr Wong Ming-yam, BBS, JP, Chairman of the Board of ASTRI delivers welcoming speech at the opening ceremony of ASTRI-SHHIC Joint Laboratory of Wireless IoT Technologies & Applications
應科院董事局主席王明鑫先生，BBS，JP於「應科院 - 華虹設計無線物聯網技術及應用聯合研發中心」啟動儀式上致歡迎辭

29/7/2015

ASTRI and Shanghai Huahong Integrated Circuit Set Up Joint Laboratory of Wireless IoT Technologies for Applications in Smart Cities and Intelligent Transportation

應科院與華虹設計成立無線物聯網技術及應用聯合研發中心以發展智慧城市和智能交通的應用

ASTRI and Shanghai Huahong Integrated Circuit Co., Ltd. (SHHIC) announced the opening of a joint laboratory on wireless Internet of Things (IoT) technologies and applications, fostering the collaboration between ASTRI and SHHIC and developing single-chip system level solutions for smart cities and intelligent transportation applications.

應科院與上海華虹集成電路有限責任公司（華虹設計）宣佈成立無線物聯網技術及應用聯合研發中心，促進雙方合作，共同研發單芯片系統級整體方案，以應用於智慧城市和智能交通上。

Guests officiate at the opening ceremony of ASTRI-SHHIC Joint Laboratory of Wireless IoT Technologies & Applications
應科院及華虹設計雙方代表與一眾嘉賓主持「應科院 - 華虹設計無線物聯網技術及應用聯合研發中心」啟動儀式

Guests officiate the Launching Ceremony of ASTRI Innovation Runway
一眾嘉賓主持「應科院創新跑道」創業學人計劃啟動典禮

Visit to ZTE Corporation
參觀中興通訊股份有限公司

Visit to HKUST Shenzhen Institute
造訪香港科技大學深圳研究院

17/8/2015

Entrepreneurship Fellow Programme 'ASTRI Innovation Runway' Launched to Nurture Young Technology Entrepreneurs

應科院推出「應科院創新跑道」創業學人計劃以培育年青科技創業家

ASTRI launched its first-ever entrepreneurship fellow programme, ASTRI Innovation Runway (AIR), offering one-stop, comprehensive pre-incubation support to assist young technology entrepreneurs with innovative ideas to start up their business. Throughout the year, a series of activities such as idea show-cases, field trips, and meetings with mentors were organised.

應科院首次推出「應科院創新跑道」創業學人計劃，提供一站式創業前期支援，全方位協助年青科技創業家實踐創新理念及成立公司，並在年度內舉辦了一系列活動如：項目投售活動、考察團、與導師交流聚會等。

Meeting and idea exchange among the AIR fellows and mentors
創業學人與導師們會面，互相交流見解

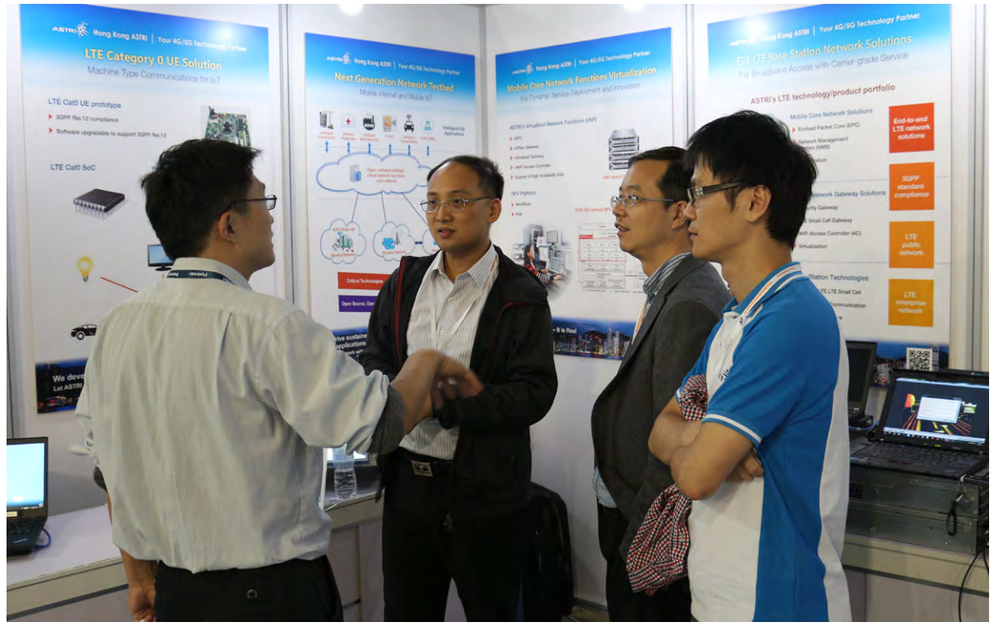
22- 25/9/2015

ASTRI Showcases the Latest Innovations on Next Generation Networks Initiative with Industry Partners at PT/EXPO CHINA 2015

應科院與業界於2015年中國國際信息通訊展覽會展示新一代網絡嶄新創新技術

ASTRI collaborated with key industry leaders including Intel®, Fujian Sunnada, Rohde & Schwarz, and ZyXEL to showcase its latest innovation on Next Generation Networks initiative including LTE/5G and network functions virtualisation (NFV) technologies at the PT/EXPO CHINA 2015.

應科院與領導者，包括英特爾®（Intel）、福建三元達、羅德與施瓦茨和合勤科技合作，在2015年中國國際信息通訊展覽會中，展示應科院最新的新一代網絡技術，包括LTE/5G和虛擬網絡功能（NFV）技術。



PT/EXPO China 2015
2015年中國國際信息通信展覽會

6/10/2015

ASTRI Delivers NFV based LTE Mobile Core Network Solution on Intel® ONP

應科院推出基於Intel ONP平台NFV的LTE移動核心網解決方案

ASTRI announced the delivery of a Network Function Virtualisation (NFV) based LTE Evolved Packet Core (EPC) Solution and a LTE Small Cell Gateway on the Intel® Open Networking Platform (Intel® ONP) on 6 October 2015 at Singapore Network Virtualisation and SDN Asia 2015.

應科院於2015年10月6日，在2015年新加坡網絡虛擬化及SDN亞洲大會，發布以英特爾®開放網絡平台為基礎，網絡功能虛擬化的LTE分組演進核心網解決方案和LTE小基站網關。

Honourable guests and panel speakers at the ASTRI Industry and University Collaboration Forum 2015
一眾參與應科院產學研合作論壇2015的嘉賓及講者

18/11/2015

ASTRI Hosts Industry and University Collaboration Forum 2015 to Share Latest Technological Research and Development and Facilitate Collaboration

應科院舉辦「應科院產學研合作論壇2015」分享最新科技發展及加強合作

With strong support from Innovation and Technology Commission and 54 supporting organisations, ASTRI hosted its annual signature event – Industry and University Collaboration Forum 2015 at the Hong Kong Science Park. The Forum received an overwhelming response with over 400 participants from various sectors and universities taking part.

應科院於香港科學園舉辦「應科院產學研合作論壇2015」。此論壇獲創新科技署及54個支持機構鼎力支持，並有逾400位來自不同界別及大學的代表參與，座無虛席。

Fellows of ASTRI Innovation Runway programme showcase their innovative projects at the Forum
「應科院創新跑道」創業學人計劃的創業學人展示他們的創業項目

The honourable Mr Nicholas Yang*, JP, Advisor to the Chief Executive on Innovation and Technology cum Member of the Executive Council, HKSAR Government delivers an opening remark
行政長官創新及科技顧問暨香港特別行政區行政會議成員楊偉雄議員*，JP致歡迎辭

Exhibition booth showcasing ASTRI's latest technologies
展覽攤位上展示應科院的最新技術

* Mr Nicholas Yang, JP is currently the Secretary for Innovation and Technology
楊偉雄先生，JP現任為香港特別行政區政府創新及科技局局長

Senior management of ASTRI and Infineon at the Agreement Signing Ceremony
一眾應科院和英飛凌（香港）管理層出席及見證合約簽署儀式

Mr Calvin Leung, Managing Director of Infineon Technologies Hong Kong Limited (front left), and Dr Frank Tong, Chief Executive Officer of ASTRI (front right), sign the agreement
英飛凌科技香港有限公司執行董事梁錦文先生（前左）和應科院行政總裁湯復基博士（前右）代表簽署協議

26/11/2015

ASTRI and Infineon Sign an Agreement on 'System Thermal Management Solutions for High Power Module' to Enhance System Performance and Energy Efficiency in High Power Density Applications

應科院與英飛凌（香港）簽訂「高功率模塊的系統級熱能管理解決方案」合約，攜手提升高功率密度應用的系統表現及能源效益

ASTRI and Infineon Technologies Hong Kong Limited (Infineon) announced the signing of a contract service (agreement) on 'System Thermal Management Solutions for High Power Module'. ASTRI and Infineon will develop thermal management solutions for high power density applications tailored to the local requirements of the Mainland and Hong Kong markets.

應科院和英飛凌科技香港有限公司（英飛凌（香港））今天宣布簽訂「高功率模塊的系統級熱能管理解決方案」合約（協議），共同為內地及香港的高功率應用市場，開發專門的系統級熱能管理解決方案。

ASTRI signs a MoU with Beijing Institute of Collaborative Innovation to establish FinTech Collaborative Innovation Centre
應科院與北京協同創新研究院簽署合作備忘錄，雙方將共同建立金融科技協同創新中心

30/11/2015

ASTRI Signs MOU with Beijing Institute of Collaborative Innovation (BICI) on Establishing Joint Research Centres and Institute of Collaborative Innovation

應科究院與北京協同創新研究院簽署合作備忘錄共建聯合研究所及協同創新中心

ASTRI signed a Memorandum of Understanding (MoU) on 28 November 2015 with Beijing Institute of Collaborative Innovation (BICI) to establish FinTech Collaborative Innovation Centre - aiming to develop research projects in the areas of financial technology, big data and mobile software platform.

應科院於2015年11月28日與北京協同創新研究院簽署合作備忘錄，雙方將共同建立金融科技協同創新中心，就金融信息安全、大數據及移動軟件平台相關方面進行科研項目研究。

4/12/2015

ASTRI and SAE Jointly Establish Research and Development Centre

應科院與新科實業共建聯合研發中心

ASTRI and SAE Magnetics (Hong Kong) Limited (SAE) joined hands to establish the ASTRI-SAE Joint R&D Centre, focusing on group-wide R&D innovation activities, with smart factory being the first chapter of this cooperation.

應科院與新科實業有限公司（新科）宣布共同成立「應科院 - 新科聯合研發中心」，專注整個集團的研發活動，發展智能工廠為是次合作揭開序幕。

Dr Frank Tong, Chief Executive Officer of ASTRI (front left) and Dr Stanley Hao, Senior Vice-President of SAE (front right) sign the agreement to jointly establish the ASTRI-SAE Joint R&D Centre
應科院行政總裁湯復基博士（前左）和新科實業有限公司高級副總裁郝山臨博士（前右）代表簽署協議，共同成立「應科院 - 新科聯合研發中心」

8/1/2016

OmniVision and ASTRI's New Heads Up Display (HUD) Delivers Clear Information to the Driver's Eye Line

豪威科技與應科院成功開發嶄新抬頭顯示裝置（HUD）為駕駛者視線提供清晰資訊

OmniVision Technologies, Inc. (NASDAQ: OVTI), a leading developer of advanced digital imaging solutions, and ASTRI announced a new heads up display (HUD) for next-generation automobiles that delivers bright, clear information to drivers, even in the daylight.

先進數字成像解決方案的領先開發商，豪威科技公司（豪威科技）和應科院宣布成功開發了一款應用於新一代汽車的嶄新抬頭顯示裝置（HUD），該HUD在白晝下也能為駕駛者提供明亮及清晰資訊。

22/2/2016

ASTRI Showcases and Performs Live Demonstrations of the Following Latest Technology Projects at the Mobile World Congress Barcelona 2016 in Spain

應科院在西班牙巴塞隆納舉辦的2016年世界移動通訊大會巴塞隆納中展示以下最新的科技項目

1. Industry first OPNFV based LTE Core Network Solution with its own FastCloud Orchestrator
2. Commercial LTE/LTE-A micro cell solution based on NXP B4860 SoC
3. Coherent Joint Transmission (JT) MIMO technologies
4. Device-to-Device (D2D) Communications solution
5. Next generation Machine Type Communications (MTC) UE solution
6. Virtualised LTE Evolved Packet Core (EPC), LTE Small Cell and Security Gateway
7. AllJoyn-based Smarthome Management System
8. LTE distributed antenna beamforming small cell

1. 首個基於OPNFV的LTE核心網解決方案及應科院FastCloud編排器
2. 以NXP B4860系統晶片為本的商用LTE/LTE-A微基站解決方案
3. 同調聯合傳輸MIMO技術
4. 裝置與裝置間通訊方案
5. 新一代機器類型通訊（MTC）用戶終端（UE）解決方案
6. 虛擬化LTE分組核心網（EPC）、LTE小基站和安全網關
7. 基於AllJoyn開發的智能家居管理系統
8. LTE分佈式天線波束賦形小基站

ASTRI showcases and performs live demonstrations on the latest technologies at the Mobile World Congress Barcelona 2016 in Spain
應科院在西班牙巴塞隆納舉辦的2016年世界移動通訊大會中展示及演示最新的科技

Honourable guests and speakers in the conference on Big Data and Analytics for Smart City
一眾參與「智慧城市的大數據和分析」研討會的嘉賓和講者

18/3/2016

ASTRI and Hewlett Packard Enterprise Host Conference on Big Data and Analytics for Smart City

應科院與HPE合辦適用於智慧城市的大數據和分析研討會

ASTRI and Hewlett Packard Enterprise (HPE) hosted a conference on Big Data and Analytics for Smart City at the Hong Kong Science Park. The conference covered the latest R&D advancements and insights on big data and analytics for smart cities. Over 150 participants from industry and academia, as well as R&D professionals took part.

應科院聯同HPE於香港科學園攜手合辦「智慧城市的大數據和分析」研討會，分享適用於智慧城市的大數據和分析的嶄新研發發展和知識。是次研討會吸引逾150名來自業界、學術界代表和研發專才參加，坐無虛席。

Ms Cally Chan, Managing Director, Hong Kong and Macau, Hewlett Packard Enterprise speaks at the conference
HPE香港及澳門董事總經理陳珊珊女士於研討會上發表演說

23/3/2016

ASTRI and State Administration of Press, Publication, Radio, Film and Television (SAPPRFT), Academy of Broadcasting Science (ABS) Set Up a Joint Laboratory

應科院與國家新聞出版廣電總局廣播科學研究院共建聯合實驗室

ASTRI and State Administration of Press, Publication, Radio, Film and Television (SAPPRFT), Academy of Broadcasting Science (ABS) announced on 23 March 2016 the establishment of the ASTRI – SAPPRFT ABS Ultra High-definition Television Technology Joint Laboratory which focuses on research and development of ultra high-definition technology and emerging video technology.

應科院與國家新聞出版廣電總局廣播科學研究院宣布共同成立「應科院 - 國家新聞出版廣電總局廣播科學研究院超高清電視技術聯合實驗室」，專注超高清技術及未來視頻技術的研發活動。

Senior management of ASTRI and State Administration of Press, Publication, Radio, Film and Television (SAPPRFT), Academy of Broadcasting Science (ABS) attend and witness the Agreement Signing Ceremony of ASTRI – SAPPRFT ABS Ultra High-definition Television Technology Joint Laboratory
一眾應科院和國家新聞出版廣電總局廣播科學研究院管理層出席及見證「應科院 - 國家新聞出版廣電總局廣播科學研究院超高清電視技術聯合實驗室」的簽約儀式

Financial Report

Overview

For 2015-16 financial year, the consolidated income and expenditure of ASTRI amounted to HK$421,364,709 and HK$407,892,267 respectively, resulting in a surplus of HK$13,472,442.

The funds from the government comprised HK$144,245,404 from recurrent subvention, HK$183,238,421 from ITF project funds, HK$741,343 from ITF General Support Programme, HK$6,408,909 from Public Sector Trial Scheme, HK$3,898,648 from ITF Internship and HK$4,506,711 from ITF for Chinese National Engineering Research Centre for Application Specific Integrated Circuit System (Hong Kong Branch). In 2015-16 financial year, the income from industry amounted to HK$78,325,273.

The total expenditure of recurrent subvention amounted to HK$134,513,736, which represented an increase of HK$9,290,873 (7.4%) compared with the previous year. The increase was mainly due to the expenses incurred in offices relocation to new premises, such as reinstatement expenses, relocation expenses and additional rent paid for new premises during renovation period. ASTRI's operation remained steady with prudent financial management throughout the year.

The total expenditure of the R&D projects amounted to HK$244,450,940, of which 75% of the expenditure was spent on manpower and 25% of the expenditure was spent on equipment and other direct costs. The total expenditure mainly represented the actual cash outflow incurred during the year for 71 full projects, 38 seed projects, two GSP projects and six public sector trial scheme projects. Meanwhile, the internship expenditure amounted to HK$3,898,648, which represented the actual cash outflow of salary payment for interns engaged in 32 full projects and two seed projects.

The consolidated financial statements of ASTRI for the year ended on 31 March 2016 have been audited by independent auditors with unqualified audit opinion, an extract of the Consolidated Statement of Income and Expenditure, Consolidated Statement of Comprehensive Income and Consolidated Statement of Financial Position are set out in the pages 114-116.

財務報告

概況

應科院在2015-2016年度的綜合收入和支出分別為港幣421,364,709元及港幣407,892,267元，所得盈餘為港幣13,472,442元。

來自政府款項包括經常性撥款港幣144,245,404元；創新及科技基金的項目研發費港幣183,238,421元；創新及科技基金的一般支援計劃資助港幣741,343元；公營機構試用計劃資助港幣6,408,909元；創新及科技基金的實習研究員計劃資助港幣3,898,648元及創新及科技基金向國家專用集成電路系統工程技術研究中心（香港分中心）提供的資助港幣4,506,711元。在2015-16年度內從業界所得的總收入為港幣78,325,273元。

經常性撥款的總支出為港幣134,513,736元，比去年同期增加港幣9,290,873元(7.4%)，主要是由於辦公室搬遷到新大廈的開支，包括舊辦公室的修復費用、搬遷費和裝修期間新辦公室的額外租金。應科院全年保持穩定經營及繼續以審慎原則執行財務管理。

研發項目的總開支達港幣244,450,940元，當中75%用於人力資源，25%用於儀器及其他直接開支，總開支主要為七十一個正式項目，三十八個種子項目，兩個一般支援計劃項目和六個公營機構試用計劃項目的實際現金支出。同時，實習研究員計劃支出為港幣3,898,648元，為實習研究員參與三十二個正式項目和兩個種子項目的實際薪酬支出。

應科院全年截至2016年3月31日止的綜合報表經由獨立核數師審計，並獲發無保留審計意見書。綜合收支表及全面收益表及綜合財務狀況表詳載於第114至116頁。

Consolidated Statement of Income and Expenditure and Comprehensive Income

綜合收支表及全面收益表

Year ended 31 March 2016 截至2016年3月31日止年度		2016 HK$ 港幣	2015 HK$ 港幣
Subvention	**資助**		
Income from Government subvention	政府資助收入	144,245,404	124,263,924
Administrative expenses	行政支出	(134,513,736)	(125,222,863)
Surplus/(deficit) on subvention	資助盈餘/(虧損)	9,731,668	(958,939)
Project Funding from Innovation and Technology Fund and Industry Contributions	**創新及科技基金及業界投入資金**		
Project fund income	項目收入		
• Innovation and Technology Fund	• 創新及科技基金	183,238,421	193,752,810
• Industry contributions	• 業界投入資金	54,022,267	35,575,897
Project expenditure	項目支出	(237,260,688)	(229,328,707)
Balance on project funding	項目資金餘額	-	-
General Support Programme	一般支援計劃		
Project fund income	項目資金收入		
• Innovation and Technology Fund	• 創新及科技基金	741,343	376,015
• Industry contributions	• 業界投入資金	40,000	54,615
Project expenditure	項目支出	(781,343)	(430,630)
Balance on project funding	項目資金餘額	-	-
Public Sector Trial Scheme	公營機構試用計劃		
Project fund income	項目資金收入		
• Innovation and Technology Fund	• 創新及科技基金	6,408,909	7,568,328
Project expenditure	項目支出	(6,408,909)	(7,568,328)
Balance on project funding	項目資金餘額	-	-
Internship Funding from Innovation and Technology Fund	**創新及科技基金的實習研究員計劃基金**		
Internship fund income	實習研究員計劃資助收入	3,898,648	3,843,724
Internship expenditure	實習研究員計劃支出	(3,898,648)	(3,843,724)
Balance on internship funding	實習研究員計劃資助餘額	-	-
Funding Support from Innovation and Technology Fund for Chinese National Engineering Research Centre For Application Specific Integrated Circuit System (Hong Kong Branch) ('CNERC-ASIC')	**創新及科技基金給國家專用集成電路系統工程技術研究中心（香港分中心）的資助**		
Expenditure incurred in relation to Funding Support from Innovation and Technology Fund	由創新及科技基金資助的有關支出	(4,506,711)	(4,560,398)
Amount for reimbursement	發還款項	4,506,711	4,560,398

Year ended 31 March 2016 截至2016年3月31日止年度		2016 HK$ 港幣	2015 HK$ 港幣
Other Income, Net	**其他淨收入**		
Other income	其他收入	24,263,006	45,988,008
Other expenses	其他支出	(16,765,455)	(24,601,445)
Other income, Net	其他淨收入	7,497,551	21,386,563
Amount Refund to the Government of The Hong Kong Special Administrative Region	**退還香港特別行政區政府款項**	(2,988,372)	(12,329,240)
Surplus Before Tax	**稅前盈餘**	14,240,847	8,098,384
Income Tax Expense	**稅收支出**	(768,405)	(482,785)
Surplus for the Year	**本年度盈餘**	13,472,442	7,615,599
Other Comprehensive Loss to be Reclassified to Surplus or Deficit in Subsequent Periods	**在以後會計期重新分類作盈餘或虧損的其他全面虧損**		
Exchange Differences arising on Translation of Foreign Operations	外幣報表換算差額	(59,073)	(148)
Total Comprehensive Income for the Year	**本年度全面總收入**	13,413,369	7,615,451

Consolidated Statement of Financial Position 綜合財務狀況表

As at 31 March 2016 於2016年3月31日		2016 HK$ 港幣	2015 HK$ 港幣
Non-current Assets	**非流動資產**		
Property, plant and equipment	物業、機器及設備	15,229,959	4,713,131
Current Assets	**流動資產**		
Accounts receivable, prepayments and deposits	賬戶應收款項、預付款項及按金	22,601,718	23,403,511
Amount due from the Government of the Hong Kong Special Administrative Region	應從香港特別行政區政府收回款項	4,379,430	4,560,398
Tax recoverable	可退回稅項	659,904	-
Cash and cash equivalents	現金及現金等值	210,565,678	260,249,921
		238,206,730	288,213,830
Current Liabilities	**流動負債**		
Accounts and other payables, provisions and accruals	賬戶及其他應付款項、撥備及應計款項	49,303,328	59,070,424
Receipts in advance	預收款項	108,645,540	143,523,013
Amount due to the Government of the Hong Kong Special Administrative Region	應付予香港特別行政區款項	3,112,579	12,430,686
Tax payable	應付稅項	-	440,965
		161,061,447	215,465,088
Net Current Assets	**流動資產淨值**	77,145,283	72,748,742
Total Assets Less Current Liabilities	**總資產減流動負債**	92,375,242	77,461,873
Non-current Liability	**非流動負債**		
Provision	撥備	1,500,000	-
Net Assets	**資產淨值**	90,875,242	77,461,873
Equity	**股權**		
Share capital	股本	2	2
Reserves	儲備	90,875,240	77,461,871
Total Equity	**股權總值**	90,875,242	77,461,873

Note:

These financial statements have been prepared in accordance with Hong Kong Financial Reporting Standards issued by the Hong Kong Institute of Certified Public Accountants, accounting principles generally accepted in Hong Kong, and the Hong Kong Companies Ordinance.

Ernst & Young will retire as auditors of the Company upon expiration of its current term of office.

The above financial information relating to the years ended 31 March 2016 and 31 March 2015 set out on pages 114-116 does not constitute the Company's statutory annual consolidated financial statements for those years but is derived from them. Further information relating to those statutory consolidated financial statements required to be disclosed in accordance with section 436 of the Hong Kong Companies Ordinance is as follows:

As the Company is a private company, the Company is not required to deliver its financial statements to the Registrar of Companies, and has not done so. The Company's auditors have reported on the financial statements of the Company for both years. The auditors' reports were unqualified; and did not include a reference to any matters to which the auditors drew attention by way of emphasis without qualifying their reports; and did not contain a statement under section 406(2), 407(2) or (3) of the Hong Kong Companies Ordinance.

備註：

本財務報表乃根據香港會計師公會頒布之香港財務報告準則、香港公認會計原則及香港公司條例編制 。

安永會計師事務所將在本公司任期屆滿後退任本公司的核數師。

以上第114至116頁截至2016年3月31日及2015年3月31日的財政資料並不構成本公司有關財政年度的法定財務報表，但這些財務資料均取自有關財務報表。有關這些法定財務報表需要根據香港公司條例第四百三十六條作進一步披露的資料如下：

由於本公司是私人公司，無須向公司註冊處遞交財務報表，同時從未遞交過。本公司的核數師已報告了兩年間的財務報表。 核數師呈交的無保留報告，並不包括該核數師在其報告不作保留意見之情況下，以強調的方式促請有關人士注意的任何事宜之提述，亦未載有按香港公司條例第四百零六（二）、四百零七（二）或（三）所 指的陳述。

ASTRI Annual Report 2015 - 2016 應科院年報

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This annual report is published by the authority of the Board of Directors of ASTRI
The project team would like to thank the various ASTRI departments and valued partners for their contributions and support.

此年報由應科院董事局授權印製
謹此特別鳴謝應科院各部門及合作夥伴為製作這份年報所提供的協助和支持。

香港應用科技研究院有限公司
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