



2004-2007 R&D PROJECTS

Project Reference GHS/005/04

Project Title **RFID Tag and Reader Technologies at UHF Band for Logistics Management**

R&D Organisation The Chinese University of Hong Kong

Abstract

To develop the core technologies in RFID tags and readers and the related network middleware and to apply the RFID technology to logistics management, the proposed research will investigate most of practical issues in building a RFID systems and its network implementation. The emphasis of the project is placed on developing active RFID systems at UHF frequency band. On the top of system, an advanced logistics management platform will be implemented and tested in a cross docking environments.

In addition to integrating existing technologies into the prototype systems, several key technologies will be developed in the project. Novel tag antennas for metal and water content environments; novel use of multilayer flexible PCB substrate for tags; low cost electronically steering antenna array for readers; new anti-collision method implemented in the readers; RFID networking using IEEE802.11 technology; and a supply/demand, shipment/receive pegging network based on RFID technology.

It is believed that with the development of RFID technology, people can further explore other business opportunities in, for example, more efficient ways to control the logistic flow in PRD region, new methods of counterfeit prevention and the manufacturing industry for making low cost RFID tags and readers.

Project Coordinator Prof Ke-li Wu

Project Reference GHS/020/04

Project Title **Development of RFID Reader**

R&D Organisation City University of Hong Kong

Abstract

The rapid adoption of RFID in Access Control, Logistic and Supermarket Check-out Systems has created a huge potential market and wealth for electronics and IT industries. Nevertheless, European and American manufacturers dominate the RFID industries, which have restricted the advancement of RFID technologies and the consumer choices. In the past, the hurdles in reliability, the cost and the standard have jeopardized the development and adoption of RFID in massive scheme applications. The establishing of ISO 18000 standards and the advancement in the microelectronic and antenna technologies can overcome these hurdle and make these applications viable. To share a part in this expanding market and to provide a RFID design both in chip/reader and backend system design/application capability, the development of smart card reader is proposed. Through the collaboration with well-established local company Surface Mount Technology Limited, and PRC company Shenzhen GoldTel Electronics Co. Ltd. and with the knowledge support of well established CityU funded Research Center of Wireless Communication and ISF funded Smart Card Design Center, this can flourish into a solely made and own by Hong Kong RFID Technology. By creating an infrastructure of know-how in security / memory / antennae / data acquisition technologies supported by wafer fabrication in China / Taiwan and by market locally and worldwide, our competitiveness in Logistic Market can be largely enhanced.

Project Coordinator Prof KN Yung



2004-2007 R&D PROJECTS

Project Reference GHS/054/04

Project Title **RFID Enablement Middleware for Enterprise Applications**

R&D Organisation The University of Hong Kong

Abstract

Technological and market forces have driven enterprises to reassess and reinvent their supply-chains. Leading edge global retailers and manufacturers are increasingly leveraging exciting Radio Frequency Identification (RFID) technology to reach superior supply chain efficiency.

To remain competitive, Hong Kong and PRD stakeholders must take steps to facilitate the adoption of RFID technology by industry. However, there is a little recognized yet critical predicament for companies, particularly SMEs and SIs, to implement RFID systems which has yet to be addressed. That is, for companies to cost effectively tackle the integration challenges between their RFID equipment (e.g. RFID readers, edge server or savant) and backend systems (e.g. ERP), which is necessary to enjoy the full benefits of RFID technology. This integration work is currently prohibitively expensive for companies in Hong Kong and the PRD region. To tackle this challenge, flexible middleware is required to help companies integrate their RFID systems with legacy systems at minimal cost.

The proposed project will address this vital challenge with flexible middleware. The latter will provide a practical solution, and will accommodate international standards such as EPC, EDI and DTTN. In addition, the proposed middleware by connecting with the RFID information infrastructures, such as a global EPC network, will contribute to solving typical supply chain management problems including track & trace, automated process monitoring, security, and anti-counterfeiting.

Project Coordinator Mr Edward Wong

Project Reference GHS/082/04

Project Title **Establishing an EPC Network Infrastructure to Enable End-to-End Supply Chain Visibility**

R&D Organisation GS1 Hong Kong Limited

Abstract

EPCglobal's vision to create an "Internet of Things" has induced the EPC/RFID tidal wave that has swept through supply chain industries across the globe. Supply chain visibility has become the core expectation from world's key players in the EPC/RFID field.

With support from Wal-Mart Corporation and Target Corporation, the largest driving force behind EPC, EPCglobal HK proposes the world's first initiative to pioneer the EPC Network Infrastructure with focused priority to achieve end-to-end supply chain visibility between the world's largest buying power and the largest manufacturing base - China.

The project aims to create the global reference model for EPC/RFID implementation in the following context:

- Technical development: to enable end-to-end supply chain visibility with an integration- friendly EPC Network Infrastructure;
- Commercial development: to ensure industry relevance of the technical development, and to create commercial show case and hence value proposition for EPC/RFID implementation
- Market development: to proliferate industry learning and buy-in, and to disseminate the technical and commercial developments as the global reference model, thus to enhance competitive edge of Pan PRD in the process of global supply chain integration.

Under management of EPCglobal HK, the project implementation shall be fully aligned with global EPC standard development. The project result shall be recommended to EPCglobal, and contribute back to the global development of EPC standards.

Project Coordinator Ms Anna Lin



2004-2007 R&D PROJECTS

Project Reference GHS/086/04

Project Title **Enabling Technologies for Single-Chip Passive UHF RFID Tags and Readers**

R&D Organisation The Hong Kong University of Science and Technology

Abstract

The objective of this project is to develop enabling technologies for low-cost single-chip CMOS passive RFID tags in the UHF frequency range from 860 MHz to 960MHz. First, enabling technologies for passive RFID tags, including antennas, power management, ultra-low-energy digital design, non-volatile memory and packaging - will be investigated. Second, these enabling technologies will be integrated for a low-cost solution. In parallel, suitable system architectures and building blocks for single-chip RFID readers will also be designed and demonstrated, including RFIC transceiver and baseband.

The project will provide RFID industry in Hong Kong and China not only with the intellectual properties (IP's) on IC modules and systems for RFID readers and tags for technology transfer but also with well-trained IC designers for future product definition and development.

Project Coordinator Prof Howard Luong

Project Reference GHS/091/04

Project Title **The Development of RFID-based Business Solutions for Counterfeit Prevention, Physical Asset Management (PAM) and Commercial Applications**

R&D Organisation The Hong Kong Polytechnic University

Abstract

This project focuses on the development of commercial applications of Radio Frequency Identification (RFID) technology in counterfeit prevention and physical asset management. These applications involve the tracking and manipulation of data carried by RFID tags. In the anti-counterfeit applications, a cost effective package will be developed for both manufacturers and retailers, which includes RFID readers and middleware for use in high-value-added products such as pharmaceutical products, garments and cosmetics. An RFID-enabled Point-of-Sale (POS) system supported by the EPC (Electronic Product Code) network will also be developed. The RFID technologies can also be used for tracking the mobile physical assets of companies. The data stored in the tag together with the appropriate sensors embedded in expensive equipment, machines, or other physical assets can be used for condition monitoring and fault prognosis.

Project Coordinator Dr SK Kwok



2004-2007 研发项目

项目编号 GHS/005/04

项目名称 **用于物流管理的UHF波段无线射频识别标签及阅读设备的技术**
研发单位 香港中文大学

项目简介

为开发 RFID 标签和阅读装置及相关网络并在物流管理中应用该技术，该项目将研究 RFID 系统和网络中的实际问题。该项目将开发两类工作在 UHF 频段的有源系统。并在该系统上实现一个物流管理平台。

该项目将开发若干个关键技术；适用于含金属或含水背景的新型标签天线；标签中使用多层可弯曲的 PCB 介质材料；阅读装置中使用低成本电扫描天线阵；网络层上实现新型防撞挤算法；使用 IEEE802.11 技术的 RFID 网络；基于 RFID 技术的出货/入货跟踪网络。

随着该技术的发展，人们可以进一步探索其它商务机会，例如：在珠江三角洲区域实现更有效的物流控制；新验伪方法；制造低成本的 RFID 标签和阅读装置。

项目统筹人 吴克利教授

项目编号 GHS/020/04

项目名称 **发展电子标签阅读器**
研发单位 香港城市大学

项目简介

电子标签应用创造一个庞大市场给电子及资讯科技工业；现时这市场是由欧洲和美国制造商所控制造成技术垄断和选择单纯；加上系统存在的稳定性、价格和互通标准上的问题，在应用上有点阻拦。快完成的 ISO18000 标准及快速发展的微电子和天线技术将会解决现有问题及使应用可行化。去分享这庞大市场，我们提议"电子标签阅读器"发展计划。透过和香港新进科技有限公司与深圳国腾电子有限公司的合作加上我们现有完善无线电通讯中心和聪明卡设计中心技术可共同发展成为属于香港拥有的电子标签技术。该阅读器具有完善保密 / 记忆体 / 天线 / 资料处理技术，加上中国及台湾生产技术和本土及国际市场，可以提升香港在国际物流市场上的竞争力。

项目统筹人 容启宁教授



2004-2007 研发项目

项目编号 GHS/054/04

项目名称 **支援企业应用射频识别技术之中间件**
研发单位 香港大学

项目简介

科技和市场动力推使企业重新检讨和改良供应链的营运模式。环球零售业及制造业的领导者正利用射频识别技术，使其供应链及企业营运更有效率。

为保持竞争力，香港及珠三角企业投资者需设法促使射频识别技术能顺利地应用在业务内。不过现时中小型企业和系统整合业者对采用射频识别技术态度审慎，主因是未意识到射频识别设备（诸如：射频识别阅读器、event 伺服器或savant）与后端系统（诸如：企业资源策划系统）整合后将带来的庞大经济效益。对不少香港及珠三角企业而言，此整合工程耗费不菲；故企业极需要一个具弹性的中间件，协助他们以具成本效益的方法，将射频识别技术，整合至其营运系统中。

针对上述企业面对之挑战，本建议书旨在透过具弹性之中间件，为企业提供一个符合 EPC, EDI 及 DTTN 等国际标之解决方案。建议之中间件亦能协助企业解决货品追踪，程序全自动监察，保安及防伪等于是供应链常见之管理问题。

项目统筹人 黄础章先生

项目编号 GHS/082/04

项目名称 **建立产品电子代码网络以提高整体供应链透明度**
研发单位 香港货品编码协会有限公司

项目简介

EPCglobal Inc. 倡议建立「物联网」的理念，在环球供应链激起一股产品电子无线代码(EPC)/无线电射频识别(RFID)技术的潮流。世界各地主要业者均期望以 EPC/RFID 作为提高供应链资讯清晰度的核心技术。

在沃尔玛及 Target Corporation 等国际最主要EPC推动单位的支援下，EPCglobal 香港倡议领先全球，建立世界首个 EPC 网路，以联系世界主要买家，以及全球最大生产基地——中国为重点，令供应链上点对点的资讯更加清晰明确。

本计划的目标是在以下层面，在国际间建立 EPC/RFID 应用参考模式：

- 技术开发：开发一个简单、易用的综合 EPC 网路，提高供应链清晰度；
- 商用发展：协助业界掌握有关技术发展，并建立商业应用案例，向业界展示应用 EPC/RFID 的价值；
- 市场开发：取得业界的认知及认同，并将以上技术及商业应用两个层面得来的发展成果，作为全球的参考范例，从而提升泛珠三角地区在环球供应链整合过程中的优势。

在 EPCglobal 香港的领导下，本计划将紧密配合 EPC 国际标准的开发，EPCglobal 香港并将与 EPCglobal Inc. 分享有关的研究成果，支援 EPC 国际标准的发展。

项目统筹人 林洁贻女士



2004-2007 研发项目

项目编号 GHS/086/04

项目名称 **适用于单晶片无源超高频射频识别读卡机和标识机的技术开发**
研发单位 香港科技大学

项目简介

本专案的目标是开发一些应用于低成本单晶片 CMOS 无源射频识别标识机的技术。此无源射频标志识别机将会在超高频 (900MHz) 中得到广泛应用。首先，一些应用于无源射频标志识别机的技术，包括天线技术，电源管理技术，超低功耗数位电路设计，非挥发性记忆体及封装技术，将会被开发。其次，这些技术将会集成于一个低成本方案中。同时，我们也会设计和展示应用于单晶片射频标志读卡机的合适的系统结构和构成模块，包括射频接收器和基带。

这个项目不但会为香港和中国提供可技术转让的射频识别读写机和标识机方面的积体电路模组和系统的知识产权，并且会为此类产品将来的规范和发展培养一批训练有素的积体电路设计者。

项目统筹人 梁锦和教授

项目编号 GHS/091/04

项目名称 **开发应用于防伪、有形资产管理及商业应用的射频识别技术及解决方案**
研发单位 香港理工大学

项目简介

本研究主要提出有关开发射频识别技术的重要商业应用：分别为防伪及有形资产管理。这些商业应用同时涉及追踪及处理电子标签内的数据。在防伪方面，主要为高增值食品、药物、成衣及化妆品等工业的制造商及零售业开发一套具成本效益的软件，当中包括电子标签读写器及其中间件。与此同时，开发一套支持 EPC 网络之基于射频识别技术的销售点系统。在有形资产管理方面，射频识别技术可为企业追踪分布于不同地点的可移动资产。储存于电子标签内的数据，配合已安装于器材、机器或其他贵重的有形资产上的感应器，可以用来监察环境及预测故障。

项目统筹人 郭少强博士