Course Code 課程編號：40150934

射頻產品 實用天線設計 課程

Practical Antenna Design

for Advanced Radio Frequency (RF) Products

1-2 March 2012

今天，無線通信產品極速發展，無線通信產品必須在短時間推出市場，才能維持競爭力。對於射頻產品，天線設計影響產品的通信範圍及質素，故成為成功推出新產品的重要因素。優良先進的天線設計，能為射頻產品設計或製造商，創造競爭優勢。

To ensure competitiveness in today's fast evolving business environment, faster time to market is necessary for wireless communication products. Playing a critical role in determining the communication range of products, RF design, antennas in particular, becomes crucial to the success of the introduction of new RF products. Competence in advanced antenna design definitely can strengthen the competitive edge of RF product design or manufacturing companies.

課程宗旨

本課程為期兩天，旨在提升參加者的天線設計技術，在實際操作及量產層面，了解切實可行的天線設計技術元素。課程涵蓋基本天線概念和定義，以及常用的先進射頻產品天線之特色、規格及性能、實用的產品設計之元素等。課程還會教授務實可行的策略，讓產品天線達致最佳性能。課程另設討論環節，以加深參加者對實用天線測量和測試的認識。Agilent Technologies Hong Kong Ltd.亦會示範阻抗測量和天線匹配。本課程由經驗豐富的射頻專家教授，透過本課程參加者可提升射頻產品設計技術，設計出高性能之產品，並能把設計疊代次數減至最少。

Course Objectives

This 2-day course aims to provide participants with technical insights on the vital aspects of antenna design from a practical and industrial perspective. The course covers the fundamental antenna concepts and definitions, introduction of features, specifications and performance of different types of commonly-used and advanced antennas in RF products and practical product design elements. Practical implementation strategies in RF products for optimum antenna performance will also be presented. To enhance participants' knowledge in practical antenna measurement and testing, a discussion session will be included. Impedance measurement and matching of antennas will also be demonstrated by Agilent Technologies Hong Kong Ltd. Conducted by RF experts with a wealth of local and international industrial experience, the course will provide participants with information to develop top-performance RF products with the minimal number of design iterations.

課程對象

射頻設計師、無線產品設計師、應用工程師、設計經理、業務發展工程師及經理，以及相關行業專家

Who Should Attend

RF designers, wireless product designers, field application engineers, design managers, business development engineers and managers, and related professionals

主辦機構 Organizer

Hong Kong Productivity Council 香港生產力促進局

PRODUCTIVITY 生產力培訓學院 training institute

協辦機構 Co-organizer

LEXIWAVE Reinventing RFIC

支持機構 Supported by

Agilent Technologies

課程大綱　Course Outline

第一日 (2012年3月1日)

基本概念

1. 天線基本理論
   - 天線基本類型
     - 雙極及單極天線、螺旋狀天線、環狀天線、電路板
   - 輻射機制
     - 輻射的來源
     - 輻射的特徵
2. 規格和性能
   - 輻射模式
   - 天線的效率及孔徑
   - 阻抗及線路匹配
   - 方向性及增益
   - 弗里斯 (Friis) 傳輸公式
3. 天線的元件
   - 雙極天線
   - 單極天線
   - 多頻天線
   - 微型晶片型的天線
   - 環形天線

Day 1 (1 Mar 2012)

Fundamental Concepts

1. Antenna Fundamental
   - Basic types of Antenna
     - Dipole, Monopole, helical, loop, printed PCB
   - Radiation Mechanism
     - Source of radiation
     - Characteristics of radiation
2. Specification and Performance
   - Radiation pattern
   - Antenna efficiency, aperture
   - Impedance and circuit matching
   - Directivity, gain
   - Friis Transmission Equation
3. Antenna Elements
   - Dipole antenna
   - Monopole antenna
   - Multi-band antenna
   - Miniature chip type antenna
   - Loop antenna

第二日 (2012年3月2日)

先進天線元件

4. 便攜式電子產品的微型天線
   - 平板天線、倒L天線、倒F天線
   - 曲折型天線、碎型天線
5. 電腦輔助CAD設計及模擬
   - CAD 工具
   - 設計策略
   - 局限因素
   - 實例分享

可行的天線裝嵌策略

6. 如何設計優良的天線
   - 了解實際要求
   - 選擇天線種類，大小及天線陣形
   - 位置及配置
7. 與產品設計師、電子工程師及機械工程師的配合工作
   - 合作之重要性
   - 優良天線設計實例

測量

8. 使用網路分析儀測量天線參數
   - 2D天線增益/樣式測量
   - 3D天線增益/樣式測量
   - RFID 13.56MHz/UHF天線阻抗/增益測量
9. 測量示範
   - VHF/UHF天線
   - UWB天線

Day 2 (2 Mar 2012)

Advanced Antenna Elements

4. Miniature antenna for portable electronics
   - Patch, inverted-L, inverted-F
   - Meandered line, fractal
5. CAD Design and Simulation
   - CAD tools
   - Design strategies
   - Limitations
   - Case studies

Practical Implementation Strategies

6. How to design good antennas
   - Understand the requirements
   - Selection of antenna type, size and geometry
   - Location and placement
7. Team work with product designers, electronic engineers and mechanical engineers
   - Why it matters
   - Case studies on designing good antennas

Measurements

8. Antenna Parameter Measurements with Network Analyzer
   - 2D Antenna Gain/Pattern Measurement
   - 3D Antenna Gain/Pattern Measurement
   - RFID 13.56MHz/UHF Antenna Impedance/Gain Measurement
9. Measurement Demonstration
   - VHF/UHF Antennas
   - UWB Antenna

備註：主辦機構保留更改課程日期及內容之權利。

Remark: Program Subject to Change.

講者簡介

劉善啟先生先後於英國及美國取得電子工程學碩士及工商管理碩士學位。他在香港及美國有超過二十一年射頻系統、產品和RFIC 設計的經驗。他曾在美國Motorola和Conexant任職主任工程師多年，主要從事手機的RFIC和矽材料調頻器開發。劉先生擁有五個射頻設計的美國專利。現時他在香港開設了無晶圓半導體公司──「立聲威科技有限公司」，主要業務為RFIC、射頻模組及射頻解決方案的設計及銷售。他同時亦於世界各地的射頻培訓課程擔任講師。

About the Speaker

Henry Lau received his M.Sc. and MBA degrees from UK and USA respectively. He has more than 21 years of experience in designing RF systems, products and RFICs in both Hong Kong and US. He worked for Motorola and Conexant in US as Principal Engineer on developing RFICs for cellular phone and silicon tuner applications. Mr. Lau holds five patents, all in RF designs. He is currently running Lexiwave Technology, a fables semiconductor company in Hong Kong and US designing and selling RFICs, RF modules and RF solutions. He has also been teaching numerous RF-related courses internationally.

課程資料 Course Information

日期及時間	2012年3月1-2日 09:30-17:00
Date & Time	1-2 March 2012 09:30-17:00
上課地點	九龍塘達之路78號生產力大樓一樓
Venue	1/F., HKPC Building, 78 Tat Chee Avenue, Kowloon
授課語言	廣東話輔以英文詞彙（英文講義）
Medium of Instruction	Cantonese with English terminology (English handout)
證書頒發	完成課程之學員可獲發出席證書
Award of Certificate	A Certificate of Completion will be awarded to participants who have completed the course
課程費用	HK$2,700 / HK$2,430 (於2012年2月4日或之前報名)
Course Fee	HK$2,700 / HK$2,430 (Enrol on or before 4 February 2012)

報名方法

1. 請填妥報名表格，電郵 (jomiwong@hkpc.org) 或傳真 (2788 5350) 致香港生產力促進局留位。
2. 請以「付款方法」中任何一種方法繳交學費。

付款方法

1. **支 票 繳 費** ：支票寄送致 - 九龍達之路78號生產力大樓3樓生產力培訓學院黃小姐
   支票請劃線，抬頭為「香港生產力促進局」
2. **現金 / 信用卡繳費**：請親身到生產力大樓一樓生產力培訓學院報名處刷卡繳費
   請星期一至五：09:00-21:00 | 星期六：09:00-17:00
3. **網 上 繳 費** ：詳情請瀏覽www.hktrainingonline.com

Application Procedure

1. Please complete the enrolment form and send by email to jomiwong@hkpc.org or fax to 2788 5350 for seat reservation.
2. Please pay the course fee via one of the methods listed in “Payment Methods”.

Payment Methods

1. **Cheque** : Please send the cheque to:
   Jomi Wong, PTI 3702, 3/F, HKPC Building, 78 Tat Chee Avenue, Kowloon
   All cheques should be crossed and made payable to “Hong Kong Productivity Council”
2. **Visa / Master**: Please pay at the enrolment counter located at 1/F, HKPC Building
   Mon – Fri: 09:00-21:00 | Sat: 09:00-17:00
3. **Online Payment**: For details, please refer to www.hktrainingonline.com

查詢 Enquiry

香港生產力促進局 Hong Kong Productivity Council
黃小姐 Miss Wong 電話 Tel：2788 5784 電郵 Email：jomiwong@hkpc.org
楊小姐 Miss Yeung 電話 Tel：2788 5833 電郵 Email：mcy@hkpc.org
網址 Website：www.hktrainingonline.com

立聲威科技（香港）有限公司 Lexiwave Technology (Hong Kong) Ltd.
林先生 Mr. Edward LAM 電話 Tel：2144 2592 電郵 Email：edward.lam@lexiwave.com

傳真 **Fax: 2788 5350**

報名表

課程編號：40150934
課程名稱：射頻產品實用天線設計課
課程費用：HK$2,700 / 2,430 -於2012年2月4日或之前報名
課程日期：2012年3月1至2日

甲部(Part A) 申請者資料 Applicant Information：

Company Name
公司名稱：_____ Position
職位：_____

English Name
英文姓名：_____ Chi Name
中文姓名：_____ Title
稱謂： □先生 □小姐 □太太 □女士

Tel
電話：_____ Mobile
手提電話：_____ e-mail
電郵：_____

Mailing Address
通訊地址：_____

乙部(Part B) 繳費方法 - 請選擇一項 Please select one only：
□現金 □支票號碼：_____，請註明為 公司 / 私人* 支票。
(支票請劃線，抬頭人為「香港生產力促進局」或 `Hong Kong Productivity Council″.)

課程費用由僱主贊助？ □ YES是 □NO否

*請刪去不適用者。

報名程序: 請填妥報名表、連同相關課程需要的文件及費用，親身或以郵遞方式遞交。郵寄地址：九龍達之路78號生產力大樓香港生產力促進局生產力培訓學院 (請於信封面註明報讀課程名稱及編號。)

重要通知:
1. 報名表(可用影印本)必須連同學費於開課前一併繳交，否則報名無效。
2. 本局已實施個人資料(私隱)政策，有關資料單張可於報名處索閱，或閣下可與本局個人資料管理主任查詢。
3. 本局建議申請者以信用咭、易辦事或支票繳交學費。學費收據以本局機印方為有效，支票收妥作實。
4. 除非本局於以下期限前收到申請者書面通知退學，否則已繳學費概不退還：
   - 由本地講師教授的課程，最少於開課前五個工作天通知
   - 由外地講師教授的課程，最少於開課前十五個工作天通知申請者
   申請退還學費需繳交手續費二百元正。
5. 申請者可提名他人代替其本人出席課程，惟事先須得本局同意。
6. 香港生產力促進局保留在任何情況下及以任何原因拒絕任何入學申請的權利。申請者繳付學費後，仍須符合入學的所有條件，其申請方可獲得接納。
7. 香港生產力促進局保留在任何情況下更改課程內容、授課地點、日期及時間的權利。
8. 颱風及黑雨警告：如課堂時間是在早上(09:00-13:00)、下午(14:00-17:00)或晚間(6:30-10:00)，將在下列情況下取消：
   (一)八號或以上颱風訊號或黑色暴雨警告訊號在早上6:00、11:00 或下午4:00仍然懸掛；或
   (二)香港天文台在早上6:00、11:00或下午4:00或之後，宣佈將懸掛八號或以上颱風訊號或黑色暴雨警告訊號。本局將盡早通知學員補課的日期及時間。
9. 以上 `重要通知″ 內容均以本院課程單張及網頁之最後更新版本為依歸

IMPORTANT NOTE:
1. Course fee must be accompanied with this form (or photocopy) before course commence, otherwise enrolment would be rejected.
2. HKPC has adopted a Personal Data (Privacy) Policy. Information about the policy is available at HKPC enrolment counters for collection. You may also contact our Personal Data Controlling Officer for further details.
3. Applicants are encouraged to pay by credit cards, EPS or cheques, if possible. Amount received will be imprinted. Cheques are subject to bank clearance.
4. Enrolment fee is not refundable unless HKPC is notified in writing of your withdrawal:
   - at least 5 working days before the course commences for training program by local speaker
   - at least 15 working days before the course commences for training program by overseas speaker
   A handling charge of HK$200 will also be levied.
5. An applicant may, subject to approval from HKPC, nominate a person to attend the course on his/her behalf.
6. HKPC reserves the right to reject any application in any circumstances and for whatever reasons. Payment of fees should only be construed as conditional acceptance of application.
7. HKPC reserves the right to change the contents, venue and / or time as necessary.
8. Classes in the morning, afternoon or evening will be cancelled if typhoon signal No. 8 or above OR black rainstorm warning is still hoisted after (or is announced by the Hong Kong Observatory to be hoisted at/after) 6:00 a.m., 11:00 a.m. and 4:00 p.m. respectively. Participants will be notified when the class will be made up as soon as possible.
9. The above `Important Note' is subject to revisions in the course pamphlets and the latest updates in the Institute's website.

聲明 Declaration：
本人聲明在此報名表格及隨附文件所載的資料，依本人所知均屬完整真確。
I declare that all information provided in this enrolment form and the attached documents are, to the best of my knowledge, accurate and complete.
本人已細閱並接受報名表內 `重要通知″ 的所有條款及細則。
I have read and accepted all the terms and conditions of the "Important Note" in this enrolment form.

申請者簽名
Applicant's Signature：_____ 日期
Date：_____