



Dear Colleague,

I am delighted on behalf of the IEEE Finland COMSOC Chapter Board to inform you that we will organize a lecture of *Professor Norman Beaulieu* from University of Alberta at 13:00 o'clock on **November 10, 2008** in Oulu. The lecture is at **room 407**. The more precise address is 4th level of Tietotalo, University of Oulu. The title of the lecture is "**Designing Ultra-Wide Bandwidth (UWB) Receivers for Multi-User Interference Environments**". The abstract can be found below. Please register to me for approximating the coffee service.

Prof. Beaulieu's biography is also below. He will make lectures also in Aalborg, Copenhagen, Chalmers, Lund and Linköping during this distinguished lecturer tour (DLT). Exact timing and places will be published on [www.ieee.se](http://www.ieee.se) at VT/COM Chapter Tag.

If you have further questions, please don't hesitate to contact me.

Yours truly,  
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## **Designing Ultra-Wide Bandwidth (UWB) Receivers for Multi-User Interference Environments**

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### *Abstract*

Ultra-wide bandwidth (UWB) wireless is envisioned as a license-free replacement for cables and wires, able to transmit at extremely high data rates over short distances and has been dubbed "Bluetooth on steroids". The principles and structures of time-hopping (TH) ultra-wide bandwidth (UWB) wireless systems are recalled and the suitability of the conventional matched filter (correlator) digital receiver for TH-UWB applications is discussed. Ultra-wideband (UWB) systems situated in the same coverage area will experience multiple-user interference (MUI), and the mitigation of multiple-user interference is an important receiver design problem. Insights into the performance of the matched filter TH-UWB receiver is gained from study of examples of the simulated probability density function of the TH-UWB multiple access interference. The unique characteristics of interference in time-hopping UWB systems is explained and some new TH-UWB receiver designs are proposed based on examining the characteristics of the simulated multi-user interference density functions. Several statistical models for time-hopped UWB MUI are presented, motivating novel receiver designs which realize superior performance in environments where MUI is significant. Soft-limiting and zonal receiver structures are intuitively motivated and shown to outperform the conventional matched filter UWB receiver by many dB's in signal-to-noise ratio (SNR). A p-order metric receiver is also proposed and its superior performance established. The improved receiver performances are explained using maximum likelihood (ML) receiver design principles. The application of the new signal detection structures in modified Rake receiver designs for multipath fading UWB channels is examined. Several of these receivers have adaptive implementations that effectively cope with MUI, multipath fading and additive white Gaussian

noise, providing significantly lower error-rate floors in comparison to the conventional linear receiver. The performance of a theoretically optimal TH-UWB receiver is established and used to benchmark the nonlinear receiver designs.

**Prof. Dr. Norman Beaulieu,**

*Biography*

**CURRICULUM VITAE**

**EDUCATION**

**Dr. Norman C. Beaulieu**

Ph.D.  
M.A.Sc.  
(first class standing)  
B.A.Sc. (with honours)

University of British Columbia, August 1986  
Department of Electrical and Computer Engineering  
University of British Columbia, 1983  
University of British Columbia, (BCERF)  
University of Alberta  
Edmonton, AB, Canada T6G 2V4  
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**PROFESSIONAL EXPERIENCE**

January 2001 - 2007  
  
September 2000 – present  
  
September 2005 - August 2008  
  
March 2001 - November 2006  
  
September 2000 - August 2005  
  
June 1996 – present  
  
December 8, 1995 - present  
  
September 2000 - August 2001  
  
January 1998 - 2001  
  
July 1993 - August 2000  
  
April 1995- August 2000  
  
July 1995- June 1998

Canada Research Chair in Broadband Wireless Communications, University of Alberta  
  
Professor and iCORE Research Chair in Broadband Wireless Communications, University of Alberta  
  
Adjunct Professor Mathematics and Statistics, Queen’s University  
  
Director of the Corporation, Eleven Engineering Incorporated, Edmonton, Alberta  
  
Adjunct Professor Mathematics and Statistics, Queen’s University  
  
President of the Canadian Society of Information Theory  
  
Licenced Professional Engineer Province of Ontario  
  
Adjunct Professor Electrical and Computer Engineering, Queen’s University  
  
Project Leader Communications and Information Technology Ontario (CITO)  
  
Professor Electrical Engineering, Queen's University  
  
Cross-Appointed Professor Mathematics and Statistics, Queen’s University  
  
Associate Head Electrical and Computer Engineering, Queens University

April 1993 - December 1997	Project Leader Wireless Coding and Diversity Project; Telecommunications Research Institute of Ontario (TRIO)
June 1994 - May 1997	Project Leader Prototype wireless modem design and implementation project involving Queen's University, The National University of Singapore and the Singapore Centre for Wireless Communication
July 1993 - August 1995	Coordinator of Communications Research Group Queen's University
July 1988 - June 1993	Queen's National Scholar Associate Professor Electrical Engineering, Queen's University
September 1986 - June 1988	Queen's National Scholar Assistant Professor, Electrical Engineering, Queen's University

## EDITORSHIPS

July 2007 – Present	Senior Editor (Inaugural) of <i>Security and Communication Networks</i> , Wiley Interscience
January 1992 - present November 2000 – December 2006	Editor for <i>Wireless Communication Theory of IEEE Transactions on Communications</i> Member of <i>The Proceedings of the IEEE</i> Editorial Board
January 2002 - December 2003	Editor-in-Chief of <i>IEEE Transactions on Communications</i>
January 2000 - December 2001	Editor-in-Chief of <i>IEEE Transactions on Communications</i>
October 1996 - August 2003	Associate Editor for <i>Wireless Communication Theory of IEEE Communications Letters</i>