

Wireless Seminar – Carleton University

Radio Propagation: Measurements, Modelling and Digital Link Performance Analysis – Part I

Dr. Robert Bultitude

Adjunct Research Professor, Systems and Computer Engineering, Carleton University

2:00 pm, Thursday, April 16, 2015 – 4359 ME (Mackenzie Building), Carleton University

The presentation to be given was prepared for a seminar in a final year undergraduate class containing students from mixed engineering disciplines and other related fields. Its content is therefore conceptual in nature, with very few mathematical representations and equations. It has the objective of introducing the field of radio transmission engineering and radio propagation research to those that might be soon met with the opportunity to enter the field within industry or in a graduate research program. The seminar begins with a statement concerning various kinds of distortion, including transmission loss, frequency-selectivity and time-selectivity that can occur on radio channels, then proceeds to discuss how each occurs in physics, how it can be measured and modelled, and how the results of such work can be applied.

Part I, for presentation in the first seminar, begins by explaining so-called free space loss and how it can be modelled, then moves on to consider transmission cases with one or two reflections from objects near a radio link that cause time or space-selective received power variations, associated modelling and applications for the results. Basic effects of radio reflections on digital transmission are then described and methods for measuring and modelling them are explained. Time varying channel impairments caused by such are considered next, including how these can be measured, modelled, and used to predict digital transmission performance. A few research and development topics of current interest in the field are highlighted briefly as the presentation proceeds and the necessary background is developed.

Part II, to be presented at a later date, discusses more advanced topics, such as measurements and modelling of the angles of arrival of radio reflections, the measurement, modelling and simulation of broadband, directional, and double directional channel variations and the use of such in studies related to gains that can be achieved through MIMO transmission.

Robert Bultitude received the BSc. (El. Eng) degree from the University of New Brunswick, Fredericton, N.B., Canada, in 1975 and the M.Eng. and PhD. Degrees in Electronics Engineering from Carleton University, Ottawa, On, Canada, in 1979 and 1987, respectively.

He was with Hoyles Niblock Associates, Consulting Telecommunications Engineers, Vancouver, B.C. Canada, from 1975 to 1977, where he did UHF and mobile link planning and propagation analyses. In 1980, he was with Leigh Instruments, Ottawa, where he worked on studies associated with radar head-end site selection, and backhaul link design.

He joined the Communications Research Centre (CRC), Ottawa, in 1981. From 1981 to 1989, he was a Research Engineer, conducting Radio Propagation Research for applications in Land Mobile Radio Systems. From 1989 to 2000, he was the Manager of CRC's Land Mobile and Indoor Radio Propagation Research Group. During 1998-2000, he was at Eindhoven University of Technology, Eindhoven, the Netherlands, where he worked as a Visiting Scientist, collaborating on mobile radio channel modelling. In year 2000, after his return from Europe, he resumed his research at CRC as a Senior Research Scientist working on mobile radio propagation measurements and channel modelling, until November, 2014, when he terminated his work at CRC. He has been an Adjunct Professor with the Dept. of Systems and Computer Engineering, Carleton University since the early 1990s, and it is in this capacity that he is speaking at the planned seminar. His presentation is not associated with any work at CRC, and neither Dr. Bultitude, nor his work represent Industry Canada, or material having a Canadian Government source in any way.

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Awards and recognition received by Dr. Bultitude include a best propagation paper award from the IEEE Vehicular Technology Society, in 1997, receipt of an NSERC Discovery Research Grant during the period 2005-2010, nomination for the chairmanship of several different commissions within the International Radio Science Union (URSI), and appointment as a Distinguished Lecturer by the IEEE Vehicular Technology Society.

[Website: <http://www.sce.carleton.ca/faculty/bultitude/bultitude.html>].