To be presented at:

2002 INTERNATIONAL SYMPOSIUM ON ADVANCED RADIO TECHNOLOGIES (ISART)

4-6 March, 2002

325 Broadway, Boulder, Colorado, 80305 USA

UWB Radio Technology - The Global View of a Wireless System Integrator

Walter Hirt, IBM Research, Zurich Research Laboratory, Switzerland

Dennis L. Moeller, IBM Personal Computing Division, Raleigh, NC, USA

Abstract – The emergence on the commercial market of novel wireless communication and positioning devices based on Ultra-Wideband (UWB) Radio Technology (UWB-RT) is widely awaited and anticipated. Indeed, in the United States of America its realization hinges only on a positive Report & Order expected to be issued by the Federal Communications Commission (FCC). However, although it is known that European regulatory bodies are also evaluating how to legalize the use of devices based on UWB-RT, little is known about the position taken by the authorities in other geographies. Nevertheless, the prospect that UWB-RT provides attractive business opportunities and enables exciting new wireless applications has not only caught the attention of the technology-providing industry but has also attracted the unanimous interest of the various wireless system integrators (WSIs). Whereas the former are generally responsible for developing the enabling core technologies, the latter deal primarily with the integration of these wireless technologies into their existing and future products in the form of subsystems or modules, preferably in combination with corresponding value-adding application packages.

Today, the mere contemplation of the task of integrating a new wireless technology into some product increasingly constitutes a challenge to WSIs, both in technical and strategic terms. While the regulatory framework must be in place, the standardization issues must also be sufficiently established and the targeted user community must be willing to accept and pay for these new products. Incentives for users to embrace a new wireless technology may include (i) the perceived benefits in the form of new applications, (ii) the degree of compatibility with existing technologies, standards and applications, and (iii) the added value relative to price. In contrast, besides form factor considerations, WSIs are mainly concerned with such parameters as additional production costs and – in cases of mobile platforms – the impact on battery power budgets, to name only some of the key criteria.

In this presentation, we first examine the promises commonly made regarding the merits of UWB-RT. We will focus on the Shannon capacity, which is often cited to support the claims of very high data rates achievable with UWB-RT. We argue that, from a practical point of view, the cutoff rate of the composite communication channel – consisting of modulator, waveform channel, and demodulator – is a more sensible criterion than capacity for assessing the potential performance of wireless devices based on pulse-based UWB-RT. The second part of the presentation examines some of the problems encountered by WSIs during the process of evaluating UWB-RT for adoption into a product line. Following a brief review of the wireless market environment, the role of global regulation and standardization is discussed. We argue that the necessary level of standardization may well depend on the intended application. Finally, although we consider the state-of-the-art of the basic UWB-RT to be fairly advanced, we surmise that its further development towards having form and power factors suitable for mobile platform integration will remain a challenge for some time to come.