UWB RADIO REGULATION:
THE QUEST FOR A GLOBALLY COMPATIBLE APPROACH (C04)

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ABSTRACT

Ultra-wideband (UWB) radio technology (UWB-RT) has the potential to become the base technology for pervasive short-range communication and measurement devices that is capable to support both high-rate wireless personal area networks (WPAN) and wireless low-rate control or sensing networks. A key advantage of UWB-RT, the license-exempt use of the radio frequency (RF) spectrum that is already occupied by licensed radiocommunication services, could also become its greatest liability. The introduction of this somewhat disruptive RF spectrum-sharing concept is a radical departure from the more common practice of splitting a contiguous spectrum range into separate bands and allocating them to licensees for their exclusive use. Thus, the successful and possibly massive deployment of UWB radio applications hinges on the ability to achieve a state of peaceful coexistence between license-exempt UWB radio devices and incumbent – as well as future – licensed radiocommunication services.

For communication and measurement applications based on UWB radio devices operating between 3.1 and 10.6 GHz, the US-based *Federal Communications Commission* (FCC) has determined that such coexistence should be possible by limiting the maximum power spectral density (PSD) emitted by UWB signal sources to –41.3 dBm/MHz (75 nW/MHz). For example, for an UWB signal bandwidth of 2 GHz at the –10 dB points, i.e., fourfold the specified minimum bandwidth of 500 MHz for such UWB radio devices, the average effective isotropic radiated power (EIRP) is limited to a mere 0.15 mW. These exemplary parameters illustrate the FCC's pragmatic assumption that the impact of UWB radio signals within the operational proximity of (narrowband) radiocommunication terminals is comparable with the effect of additive broadband noise, whose level is typically below the ambient interference at the terminal's receiver.

In a pioneering action in 2002 the FCC amended *Part 15 of the Commission's Rules* (FCC 02-48; ET Docket 98-153) to permit marketing and operation of certain types of new products incorporating UWB-RT. When announcing their action, the FCC stated their concern that these adopted rules "… *may be overprotective and could unnecessarily constrain the development of UWB technology*." Subsequently, this *fait accompli* by the FCC, together with remaining as well as new questions on the coexistence of UWB radio devices and radiocommunication services, led the *Radio Communication Sector* of the *International Telecommunication Union* (ITU-R) and regulatory authorities in Europe and the Asia-Pacific regions to establish work groups to study the potential impact of UWB signals on exposed radiocommunication services and to identify measures to avoid any harmful interference. The final technical results and conclusions from these studies, which will provide the foundation for the definition of appropriate regulatory and standards frameworks for UWB radio applications, will only become available later in 2005. The expectations of the fast growing community of *UWB Radio Proponents* regarding the pending regulatory decisions in key geographic areas beyond the FCC's jurisdiction are clear, i.e., these decisions should facilitate the widespread use of UWB radio, leverage its operational advantages and – last but not least – provide for economies of scale. Thus, the final regulatory specifications and recommendations need to be based on a globally harmonized approach to achieve a high level of compatibility and interoperability of UWB radio devices.

As of early 2005, the United States of America is still the only country where UWB radio devices can operate under a legal framework. The FCC has already certified a number of radio devices based on UWB-RT and continues to amend and clarify its corresponding rules, mainly in response to petitions from the industry. Thus far, this constructive and responsive process has resulted in either the confirmation of the original rules or in the removal of certain operational constraints and/or ambiguities in the ruling text. In contrast, the status of the UWB radio regulatory process in other geographies basically tracks the uncertain status reached within the ITU-R (TG 1/8), which in turn is influenced by the results and positions reached in the *European Conference of Postal and Telecommunications Administrations* (CEPT). Thus, the final CEPT position on how to proceed with the UWB radio regulatory process in Europe could strongly influence the regulatory decisions adopted on a global scale. On the other hand, in parallel to early market entries of specific UWB radio products, development activities and business interests in UWB radio applications are growing exponentially, bringing this still somewhat controversial technology closer to the (mass) market.

This paper provides an overview and status assessment of UWB radio regulatory matters, with an emphasis on relevant CEPT and ITU-R developments. Operational requirements for WPAN and other applications based on UWB-RT are given, and examples of protection requirements for radiocommunication services and coexistence issues are described.