KOLLOQUIUM

Institut für Elektrotechnik, Elektronik und Informationstechnik

Multiband OFDM Ultra-Wideband Systems

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Diskussionsleitung: Prof. Dr.-Ing. J. Huber

Recently, wireless communications using ultra-wideband (UWB) signals has received great attention among industry groups, academia, and standardization and regulation bodies, not to mention the military. The major boost came in February 2002 with the decision by the U.S. Federal Communications Commission (FCC) to allow unlicensed UWB operation in the 3.1-10.6 GHz band. Subsequently, IEEE 802.15 established two task groups to develop physical layers based on UWB signaling. IEEE 802.15.3a is (or was) concerned with UWB for high data-rate applications, and IEEE 802.15.4a focuses on lower data-rate UWB systems with very low power consumption and low-cost implementation.

In this talk, we concentrate on UWB wireless transmission for highdata-rate applications based on the so-called multiband orthogonal frequency-division multiplexing (MB-OFDM). MB-OFDM was one of the two main contenders for standardization by the IEEE 802.15.3a and is promoted by the WiMedia Alliance industry consortium. After an overview of the MB-OFDM system architecture we address the question of how to analyze the error-rate performance of such systems. This is of great practical relevance, since the simulative evaluation of error rates can easily take weeks and, as we shall demonstrate, may produce misleading results and thus cause flawed designs. The error-rate analysis is, however, a non-trivial problem since the nature of the UWB channel (model) and the prescribed coding and interleaving techniques prohibit the application of standard error-rate bounds. We present two semi-analytical methods, with distinct merits and limitations, which are easy to implement, run fast on general purpose computers, and thus greatly facility MB-OFDM system analysis and design.

As a side product of this talk, we wish to make it apparent to the audience that UWB communications systems selected for high data-rate transmission are far from being exotic but apply rather standard communication techniques.