

SILVA, Mário Marques da - *Emergent Radio Systems*. Lisboa: Instituto Superior Técnico da Universidade Técnica de Lisboa, 2005. PhD Thesis

Abstract: Emergent services are demanding higher data rates, especially in the downlink. Wideband Code Division Multiple Access (WCDMA) is the key to reach this development in cellular communications. To obtain this, it is important to find schemes able to reduce Inter-Path Interference (IPI) and Multiple Access Interference (MAI), and to explore new types of diversity. These are the objectives of the present thesis.

Interference cancellation subject considers post-processing and pre-processing schemes. A new linear Multi-User Detector (MUD) is proposed and analyzed. As pre-processing schemes, the new Pre-distortion and the Precoder schemes are studied and analyzed.

New types of diversity are also presented and analyzed. A new post-processing detector for the Vertical Bell Laboratories Layered Space-Time (V-BLAST) Multiple Input Multiple Output (MIMO) scheme, optimized for WCDMA signals subject to frequency selective fading, is proposed and analyzed. Moreover, a new frequency domain pre-processing scheme for frequency-selective fading MIMO channels is also proposed and analyzed.

The new Beam-Selective Transmit Diversity (BSTD) can be seen as a composite scheme where the MAI reduction is performed jointly with the exploration of transmit diversity, without additional Mobile Station (MS) complexity.

It is shown that, in most conditions, the pre-processing scheme for MIMO channels tends to achieve the best performance in most scenarios, being followed by the BSTD which allows interference cancellation and provides diversity. Both schemes tend to lead to good performances and capacities, facing the requirements of the emergent cellular communication systems. Depending on the complexity and size constraints imposed to the MS, the present thesis suggests the scheme that should be selected to allow such improvements.