

Soft rake and DFE based IDMA systems for underwater acoustic channels

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Two single-element downlink interleaved division multiple access (IDMA) based receivers employing adaptive decision feedback equalization (DFE) and conventional soft Rake are proposed for multi-user underwater communications channels. The chip-level DFE is optimized using time-multiplexed training based on the mean square error criterion (MSE), which is generated by exchanging soft information with the single-user's channel decoders. In contrast, the soft-Rake IDMA receiver utilizes iterative channel estimation with reconstructed multiple-access interference (MAI) signals and the detection is implemented using parallel interference cancellation (PIC) to remove MAI effects between users. Furthermore, in both receivers, the carrier phase recovery is jointly optimized. The

receivers are investigated in short range shallow water acoustic channels using signals acquired during sea-trials in the North Sea. Results for synchronous multi-user scenarios with 2 and 4 users, at an effective rate of 439.5 bps per user for 4 kHz of system bandwidth, demonstrate that the DFE-based IDMA receiver can reduce intersymbol interference (ISI) efficiently while outperforming the standard soft Rake IDMA receiver. (5 pages)

Keyword: Multiuser Detection , IDMA , DFE