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Overloaded CDMA Systems with Displaced Binary Signatures

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Abstract

We extend three types of overloaded CDMA systems, by displacing in time the binary signature sequences of these systems: (1) random spreading (PN), (2) multiple-OCDMA (MO), and (3) PN/OCDMA (PN/O). For each of these systems, we determine the time shifts that minimize the overall multiuser interference power. The achievable channel load with coded and uncoded data is evaluated for the conventional (without displacement) and improved (with displacement) systems, as well as for systems based on quasi-Welch-bound-equality (QWBE) sequences, by means of several types of turbo detectors. For each system, the best performing turbo detector is selected in order to compare the performance of these systems. It is found that the improved systems substantially outperform their original counterparts. With uncoded data, (improved) PN/O yields the highest acceptable channel load. For coded data, MO allows for the highest acceptable channel load over all considered systems, both for the conventional and the improved systems. In the latter case, channel loads of about 280% are achievable with a low degradation as compared to a single user system.

Keywords

oversaturated channels, total squared correlation, CDMA, random spreading, interference cancellation, turbo detection