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Research Letter

Optimal Filtering in Pilot-Aided Carrier Recovery

Arnaldo Spalvieri and Luca Barletta

Dipartimento di Elettronica e Informazione, Politecnico di Milano, Piazza Leonardo da Vinci, 32, 20133 Milano, Italy

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Abstract

The paper deals with carrier recovery based on pilot symbols in single-carrier systems. Wiener's method is used to determine the optimal unconstrained filter in estimation of phase noise assuming that a sequence of equally spaced pilot symbols is available. Our analysis allows to capture two effects that are not considered in the existing literature: the impact of aliasing due to sampling of the phase noise sequence at the pilot rate and the cyclostationary nature of the estimate hence of its performance. Experimental results are derived also for the case, where the filter is constrained to the cascade of two moving averages. These results show that, in the considered example, the mean-square phase error of the constrained filter is within 0.35 dB from the MSE of the optimal filter.