# Adaptive Per-spatial Stream Power Allocation Algorithms for Single-User MIMO-OFDM Systems

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**Abstract**

This paper presents adaptive per-spatial stream power allocation algorithms for Single User Multiple-Input Multiple-Output Orthogonal Frequency Division Multiplexing (SU MIMO-OFDM) systems. Three efficient and low-complexity Greedy Power Allocation (GPA) algorithms are proposed to maximize the throughput and spectral efficiency of the SU MIMO-OFDM systems. Firstly, the low-complexity pre-coded GPA algorithms are developed for the MIMO systems. The spatial sub-channels are created by applying the so-called Singular Value Decomposition (SVD) technique on the MIMO channel matrix, and then the Pre-GPA algorithms are applied to exploit the multi-path and spatial diversities. Secondly, the spatial and frequency diversities are exploited by adaptively allocating the system sub-carriers to the spatial sub-channels followed by Per-Spatial GPA (PSGPA). Finally, spatial multiplexing-based GPA algorithms are proposed to optimize the spectral efficiency of the SU MIMO-OFDM system. An optimal two-dimensional Spatial-Frequency GPA (SFGPA) algorithm is proposed to efficiently improve the average system spectral efficiency. The high computational complexity of the optimal SFGPA solution is simplified by proposing a low-complexity Per-Spatial GPA with Excess Power Moving down (PSGPA-EPMd) algorithm, which moves the per-spatial excess power downwards to enhance the spectral efficiency of the spatial multiplexing-based SU MIMO-OFDM systems. The proposed algorithms achieve better spectral efficiency and maximize the throughput in comparison with conventional algorithms.

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