

Interference broadcast channel (IBC) is a generalized scenario for interference channel (IC) where each base station (BS) transmits to multiple users in its own cell while sharing same time-frequency resources with other adjacent BSs. In this case, it has been shown that by using interference alignment (IA) and under the availability of perfect channel state information (CSI), the achievable degrees of freedom (DoFs) can be linearly scaled up with the number of users. However, in the presence of imperfect CSI, the sum rate becomes degraded, and the achievability of full DoF can not be guaranteed. In this paper, considering a multiple-input-multiple-output (MIMO) IBC with constant channel coefficients, we propose IA algorithms that result in unitary beamformers. First, we consider two improved beamformer designs based on minimizing the weighted-leakage interference (Min-WLI) and maximizing the signal-to-interference-plus-noise ratio (Max-SINR). Second, we propose a novel minimum-mean-square-error (MMSE)-based IA algorithm. Both the improved Max-SINR and the MMSE-based IA schemes are optimized upon the knowledge of the channel estimation error variance so as to achieve better performance under CSI mismatch. We then demonstrate that these two schemes outperform Min-WLI and the conventional Max-SINR IA under perfect and imperfect CSI. Furthermore, it is shown that the MMSE-based IA achieves the same performance trend as the improved Max-SINR IA does; however, the former needs less CSI to be available and has less computational complexity compared to the latter. Moreover, it is established that the MMSE-based IA can result in diagonalized, decoupled subchannels under perfect CSI. The superiority of the proposed algorithms over the conventional schemes is corroborated by numerical simulations.