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Experimental evaluation of relative calibration in a MISO-TDD system

We study the transmit time reversal beam-forming in a 8×1 MISO communication system at 2.68GHz. We consider the downlink time reversal transmission where a base station (BS) communicates with one user. A prototype composed by 8 antennas and designed by Orange labs acts as the base station while the user has a single antenna. The reciprocity property is destroyed by the non-symmetric characteristics of the radio frequency (RF) electronic circuitry. We use relative calibration which is based exclusively in signal processing techniques to solve this issue. Utilizing a controlled test setup based on OpenAirInterface (OAI), the ExpressMIMO2 software defined radio boards, as well as a servo controlled rail, we compare the performance of the different prototypes in terms of the received beamforming Signal to Noise Ratio (SNR). We also evaluate the performance of an antenna selection scheme at the transmit side as a low-cost low-complexity alternative to capture many of the advantages of multi-antenna systems. The measurements show that the relative calibration method is performing almost optimal and that the complexity can be significantly reduced by using antenna selection.

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