Test-Bed Implementation of Iterative Transceiver Design and Power Control for Wireless MIMO Interference Networks

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Test-bed implementation of iterative transceiver design and power control algorithm for downlink transmission in a multiple-input multiple-output (MIMO) cellular network is presented[1]. The network consists of three cells where within each cell one base station (BS) communicates with one mobile station (MS) while interferes the other MSs outside the cell. Each terminal is equipped with two antennas and the air interface of the network is designed based on OFDM modulation.

The implemented algorithm performs power control to guarantee successful communication at a desired transmission rate while designing transmitter precoders according to the elegant interference alignment concept. Interference alignment in an interference network refers to “a construction of signals in such a manner that they cast overlapping shadows at the receivers where they constitute interference while they remain distinguishable at the intended receivers where they are desired” [3]. An extension of the original interference alignment algorithm, called MaxSINR, along with a power control method is incorporated in our algorithm to guarantee a *fixed* rate communication and minimization of transmit power at the same time.

The indoor measurements were performed on an universal software radio peripheral (USRP) based test-bed. Fig. 1 shows the network structure where the algorithm was implemented in.

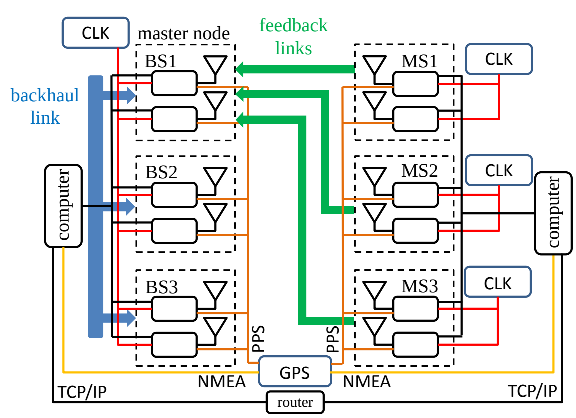

Fig. 1: Network structure.

[1]This work is mainly based on the works that were done in [1] and [2].

The test-bed consists of 12 USRP transceivers each governing one antenna in the network. Two computers control the BS and MS nodes. The back-haul and feedback links are provided through separate Ethernet links. A three-level synchronization scheme is also applied to synchronize the signals in the time and frequency level.

Measurements performed in an indoor office environment suggest at least 4 dB reduction in transmit power in 90% of the time and at the same time a better bit-error-rate (BER) performance compared to the case where MaxSINR algorithm with no power control was implemented. The power saving gains as high as 13 dB was also observed in 10% of the measurements.

References

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