SINR Performance of Distributed MIMO Mobile Channel Using Null-Space Expansion

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Null-Space Expansion (NLSE) is known to improve the performance of multi-user MIMO system because it can be robust against channel fluctuation of mobile channels. NLSE sets the combining weights be orthogonal not only to the most recent channels of the interferers but also to the previous paster ones; however, the previous studies[1],[2] have not assumed MIMO using distributed basestation antenna array. This paper evaluates the SINR performance of multiuser MIMO using NLSE in case of the distributed MIMO where four subarrays are placed in the corners of a square shape cell area, as shown in Fig. 1. Each subarray has eight elements, and the element space are set as described below. One desired terminal and six terminals as undesired signals are assumed. One hundred scattering points are assumed on the ring of 30 meter radius around each terminals for mobile fading channels, and shadowing are not taken in account. All the terminals move to the y-axis's direction, and the maximum Doppler frequency is set to 190 Hz and channel matrix can be ideally sampled at every 1 ms. Zero-forcing criterion is used for MIMO space filtering. Figure 2 shows the simulation results of cumulative distributions of SINR and SNR. It can be seen that the wider element space gives the better SINR performance.

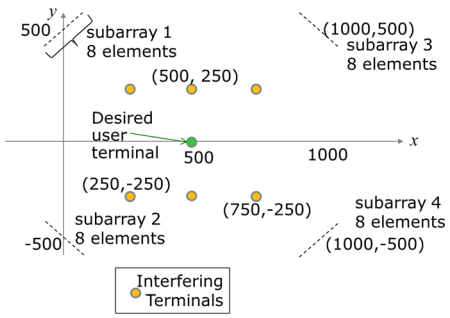

Figure 1. Simulation model of Multiuser MIMO environment of distributed BS antenna arrays.

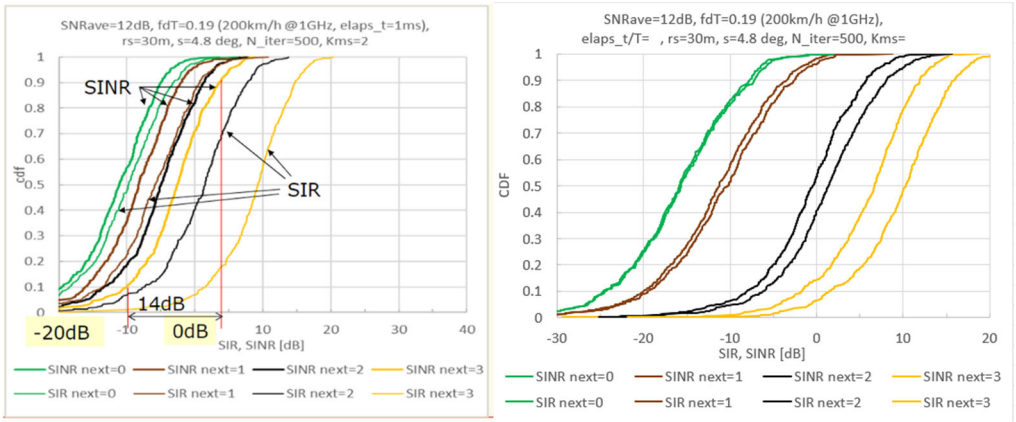

Figure 2. Cumulative distributions of SINR and SNR in multiuser MIMO with NLSE.
Left: Antenna element space λ/2 (half wavelength), Right: 2λ.

References

[1] T. Iwakuni, K. Maruta, A. Ohta, Y. Shirato, T. Arai, M. Iizuka, "Null-Space expansion for multiuser massive MIMO inter-user interference suppression in time varying channels," IEICE Trans. Commun., Vol. E100-B, No. 5, pp. 865-873, May 2017.

[2] M. Taromaru, M. Ohta, R. Ono, D. Tokuyasu, "On interference reduction performance in use of remaining array freedom over the number of interference to mitigate degradation due to channel fluctuation," IEICE Technical Report, RCS2015-152, pp. 119-122, August 2015.