

About the Distributed-MIMO Demonstration

NEC conducted a simultaneous connection experiment among multiple terminals in a real office environment at the NEC Tamagawa Plant (Figure 1). Demonstration equipment consisted of a base station and antenna modules distributed and installed in eight locations, as well as a digital control unit that controls the antennas, and a baseband processing device that converts and connects to the application layer. Also, in order to secure the complementarity and correlation between the uplink and downlink, which are important in determining the weighting coefficient of the phase and amplitude of the radio waves radiated from each antenna, a CMOS bidirectional transceiver IC developed in collaboration with Professor Kenichi Okada of Tokyo Institute of Technology was used to stabilize the phase / amplitude calibration state and spatial resolution against changes over time and the environment.

In the experiment, up to 6 terminals were simultaneously connected to one base station using a spatial multiplexing technique on desks in an area of approximately 18m x 8m, and as one of the terminals was moved to a desk position, the modulation accuracy of the terminal was then measured. When the terminal was moved, the uplink signals emitted from each of the 6 terminals were received by 8 base station antennas that were arranged in a distributed manner. Then, by digital signal processing, the propagation path was estimated and orthogonally independent downlink signals were emitted to the six terminals. By suppressing the interference between downlink signals directed to each terminal, NEC confirmed the possibility that modulation accuracy can be obtained for all terminals throughout the office.



Figure 1: Illustrates the sum of the number of simultaneously connected terminals and the total throughput, as well as the average value (calculated value) for the terminal position. Compared to the equivalent of a very small cell base station (femto base station) with the same bandwidth, the overall throughput and the maximum number of simultaneous connections are about 3 times that of a case of a small cell base station where 2 units are saturated.

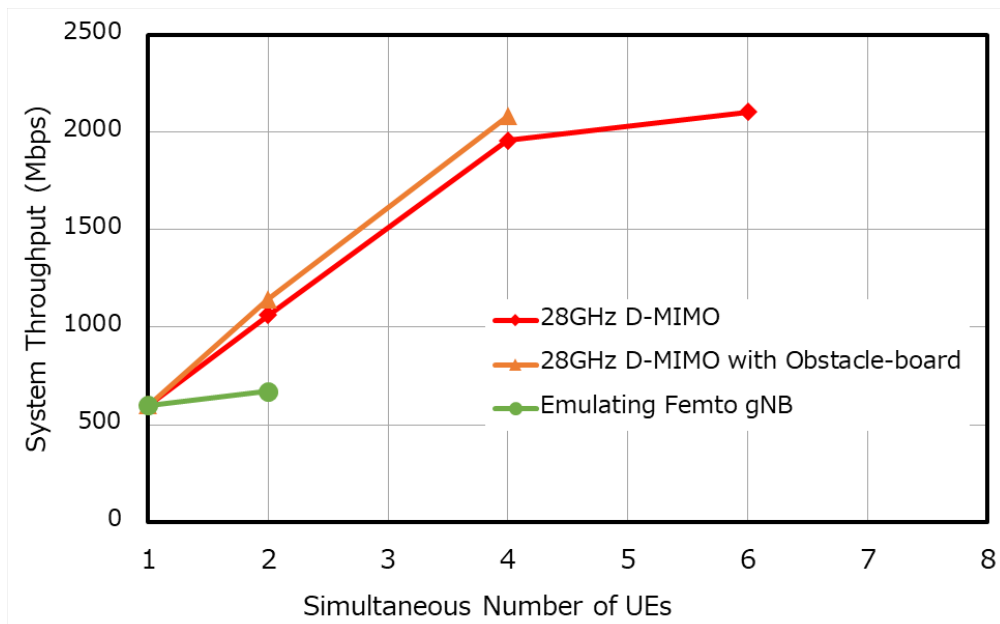


Figure 2: Number of terminals connected at the same time and overall throughput, total / average value