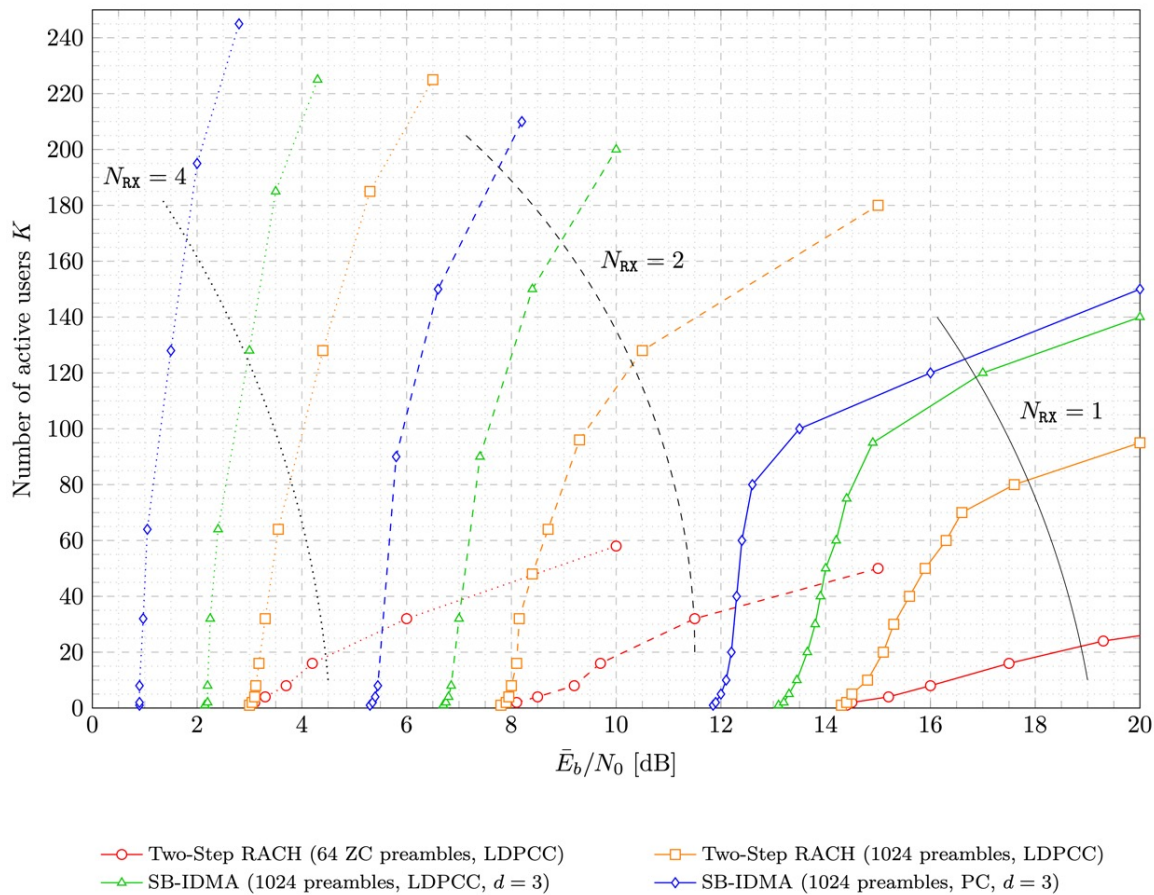


Evolution of the 5G 2-Step Random Access towards 6G Unsourced MAC

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How to upgrade 5GNR by means of grant-free random access?



KEY FINDINGS

The two introduced improvements (enlarged preamble family, and packet repetition) allow to dramatically improve the performance of the legacy two-step RACH approach of 5GNR, multiplying the number of supported users by an order of magnitude.

The picture shows the performance of the 3GPP 5GNR standard (two-step RACH, with 64 preambles) in terms of supported number of users vs signal-to-noise ratio, with a slot of approx. 30000 channel uses. The result is provided for 1, 2 and 4 antennas at the base station. On the same chart, the performance achieved by low-complexity improvements based on an augmentation of the preamble family (1024 preambles) and by introducing packet repetition ($d=3$ repetitions) is provided.

Patrick Agostini, Jean-Francois Chamberland, Federico Clazzer, Johannes Dommel, Gianluigi Liva, Andrea Munari, Krishna Narayanan, Yury Polyanskiy, Slawomir Stanczak, Zoran Utkovski, "Evolution of the 5GNR Two-Step Random Access towards 6G Unsourced MAC," May 2024, White Paper.