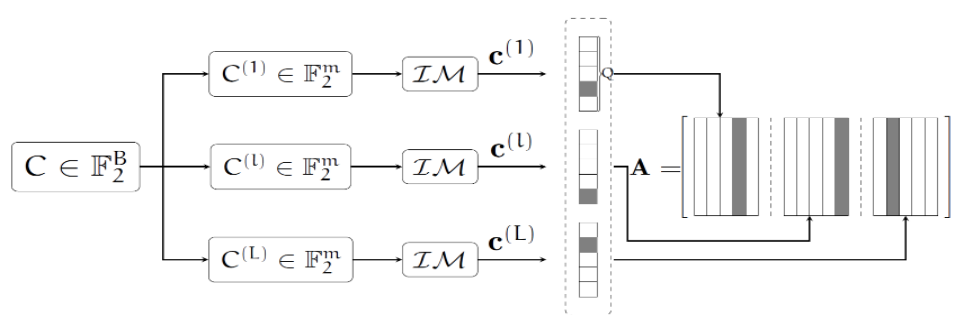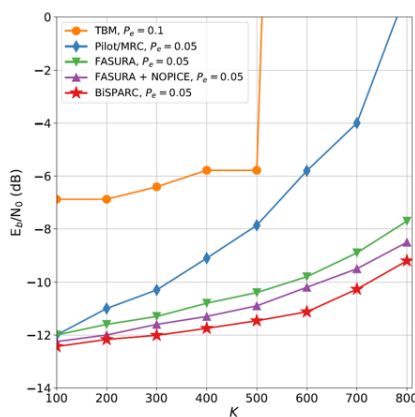# Index Modulation for Unsourced Random Access in mMIMO with Quasi-Static Fading Channels

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What are good coding schemes for URA in mMIMO with quasi-static fading channels?

a) Synopsis of code-based index modulation with 1-out-of-Q index modulation; b) Evaluation of proposed approach against competing state-of-the-art schemes.

KEY FINDINGS

In typical wireless systems, the coherence block-length T can vary from a few hundred to several thousand, primarily depending on the transmitter's speed. The coherence bandwidth, on the other hand, relies on the maximal delay spread, which generally hinges on propagation conditions. In current systems, the number of complex symbols within an OFDM coherence block can range from $T=100$ to $T=20000$, depending on assumed speed and environmental geometry. Notably, at the higher end of this range, coupled with mMIMO receivers, a communication regime emerges where sparse support recovery algorithms demonstrate exceptional performance. Consequently, an intuitive approach to designing effective communication schemes leans towards modulation schemes that optimize resource utilization. In this context, sparse-regression-codes, often combined with advanced compressed sensing algorithms, have seen widespread use. It's evident that SPARCs represent a special case of what's commonly known as code-based index modulation (CB-IM). While the connection between these concepts may seem clear initially, the exploration of other forms of index modulation within the realm of unsourced random access (URA) remains largely uncharted. This work represents an initial effort to bridge the concepts of index modulation and unsourced random access, aiming to uncover the potential mutual benefits they may offer.

P. Agostini, Z. Utkovski and S. Stanczak, "BiSPARCs for Unsourced Random Access in Massive MIMO," 2023 57th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, USA, 2023, pp. 299-303, doi:10.1109/IEEECONF59524.2023.10477087