Fixed-Point Arithmetic for Implementing Massive MIMO Systems

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Abstract—**Massive MIMO base stations are expensive to build due to the requirement for a large number of RF transceivers and high-resolution analog-to-digital converters. A way to reduce the implementation cost is to build the base stations with inexpensive hardware, resulting in the received signals to be coarsely quantized. First, the required signal power needed to achieve different receiver Bit-Error Rate (BER) levels is determined, as well as the extra signal power needed due to the quantization for given BER levels. To implement the data detection and decoding process in real time, fixed-point arithmetic with reduced precision is used. This article also reports the minimum wordlength needed to maintain the BER at acceptable levels. Specifically, the eigenvalue decomposition, which is the most computationally demanding portion of the receiver algorithm, can be calculated with wordlengths of 7 and 10 bits for eigenvectors and eigenvalues, respectively.**

Keyword—**Massive MIMO, fixed-point arithmetic.**

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