Title: A Taxonomy of ADC Error Correction Techniques: Digital Error Correction, Self-Calibration, and Dynamic Element Matching

Abstract: This paper presents a unified taxonomy of error correction techniques for analog to digital converters (ADCs), organized into three major categories: digital error correction (DEC), self calibration, and dynamic element matching (DEM). DEC exploits architectural or operational redundancy to relax analog accuracy requirements and digitally resolve errors such as comparator offsets or sub DAC mismatches. In contrast, self calibration techniques allow the ADC to internally measure its own nonidealities—including gain, offset, and component mismatches—and then apply digital or analog corrections based on these internally derived estimates. DEM techniques dynamically randomize or spectrally shape mismatch errors to suppress distortion and improve linearity, typically leveraging circuit redundancy without requiring explicit calibration. By systematically comparing these approaches in terms of their underlying principles, achievable performance (speed and precision), and potential for chip area and power reduction, this taxonomy clarifies their complementary roles to offer guidance for selecting appropriate error correction strategies in modern high resolution, high speed ADC design.