

Structural properties of array-based non-binary low-density parity-check (NBLDPC) codes are studied in this paper. First, we characterize graphical substructures induced by codewords of symbol weight six in array-based NBLDPC codes defined by parity-check matrices with column weight three. We also reveal necessary conditions for these graphical substructures to incur weight-6 codewords. Such conditions can be used to select nonzero elements for avoiding weight-6 codewords or reducing the multiplicity of weight-6 codewords. Second, we show that there exist weight-7 codewords in array-based NBLDPC codes defined by parity-check matrices with column weight three. As a byproduct, we find that the graphical substructure induced by a weight-7 codeword takes the graphical substructure induced by the related weight-6 codewords as a subgraph. Third, we show that there may exist codewords with symbol weight four, six, and seven in array-based NBLDPC codes defined by parity-check matrices with column weight two. These results enrich the structural analysis of array-based LDPC codes. In addition, simulation results show the performance advantage of array-based NBLDPC codes.