

## **Sums of subsets of $GF(2^r)$ and applications to the $q$ -ary partial erasure channel**

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The  $q$ -ary partial erasure channel was proposed by Cohen and Cassuto in 2014 to model a measurement channel based on flash memory applications. It is a generalization of the  $q$ -ary erasure channel in which a flawed reading process can leave a symbol partially erased. The decoding analysis of a natural message-passing algorithm depends on estimating the number of elements in the sum of random subsets of  $GF(q)$ . In this paper, we investigate special cases of the problem over fields of the form  $GF(2^r)$ , which are of practical importance in applications. We then use these bounds to improve estimates of the density-evolution equations for the decoding algorithm.

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