报告名称：MSR codes with linear field size and smallest sub-packetization for any number of helper nodes

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专家简介：胡思煌，山东大学网络空间安全学院副院长，教授、博导，国家重点研发计划首席青年科学家，入选国家级青年人才计划。获德国洪堡基金奖学金、山东省泰山学者青年专家。目前主要研究方向是通信与存储编码理论。在组合数学与信息论期刊和会议上发表 20 余篇论文，主持国家重点研发计划青年科学家项目，基金委青年项目和 CCF-华为胡杨林基金理论计算机专项。

报告摘要：The sub-packetization \ell and the field size q are of paramount importance in the MSR array code constructions. For optimal-access MSR codes, Balaji et al. proved that \ell\geq s^{\left\lceil n/s \right\rceil}, where s = d-k+1. Rawat et al. showed that this lower bound is attainable for all admissible values of d when the field size is exponential in n. After that, tremendous efforts have been devoted to reducing the field size. However, till now, reduction to linear field size is only available for d\in\{k+1,k+2,k+3\} and d=n-1.

In this work, we construct the first class of explicit optimal-access MSR codes with the smallest sub-packetization \ell = s^{\left\lceil n/s \right\rceil} for all d between k+1 and n-1, resolving an open problem in the survey (Ramkumar et al., Foundations and Trends in Communications and Information Theory: Vol. 19: No. 4). We further propose another class of explicit MSR code constructions (not optimal-access) with even smaller sub-packetization s^{\left\lceil n/(s+1)\right\rceil } for all admissible values of d, making significant progress on another open problem in the survey. Previously, MSR codes with \ell=s^{\left\lceil n/(s+1)\right\rceil } and q=O(n) were only known for d=k+1 and d=n-1. The key insight that enables a linear field size in our construction is to reduce \binom{n}{r} global constraints of non-vanishing determinants to O_s(n) local ones, which is achieved by carefully

designing the parity check matrices. This is a joint work with Guodong Li, Ningning Wang, and Min Ye.