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Maximum and Full Weight Spectrum Codes

In the recent work [3], a combinatorial problem concerning linear codes over a finite field $\mathbb{F}_q$ was introduced. In that work the authors studied the weight set of an $[n,k]_q$ linear code, that is the set of non-zero distinct Hamming weights, showing that its cardinality is upper bounded by $\frac{q^k-1}{q-1}$. Codes meeting this bound are said to be *maximum weight spectrum* (MWS) codes. Shi *et. al.* showed that MWS codes exist in the case $q=2$, and in the case $k=2$. They conjectured that MWS codes exist for every prime power q and every positive integer k. In this talk I discuss bounds on the length of MWS codes, and in the process, prove the conjecture. I also discuss a related question regarding full weight spectrum (FWS) codes, which are those codes having codewords of each weight less than or equal to n. Results discussed may be found in [1,2].

[1] TA, A note on full weight spectrum codes, *Transactions on Combinatorics*, (to appear).

[2] TA, and Alessandro Neri, Maximum weight spectrum codes,*Advances in Mathematics of Communications*, (to appear).

[3] Minjia Shi, Hongwei Zhu, Patrick Solé, and Gérard D. Cohen, How many weights can a linear code have?, *Designs, Codes and Cryptography*, May 2018.