1145-05-2499 **Nigel Boston** and **Jing Hao*** (jing.hao@wisc.edu). *Weight distribution of quasi-quadratic residue codes.*

Quasi-quadratic residue codes (QQR codes) are a family of binary linear codes. We are interested in these codes mainly for two reasons: Firstly, they have close relations with hyperelliptic curves and Goppa's Conjecture, and serve as a strong tool in studying those objects. Secondly, they are very good codes. Computational results show they have large minimum distances when $p \equiv 3 \pmod 8$.

We will prove that $PSL_2(p)$ acts on these codes and use this to prove a new discovery about their weight polynomials, i.e. they are divisible by $(x^2 + y^2)^{d-1}$, where d is the corresponding minimum distance. The proof uses shadows of codes, a powerful tool to study weight polynomials. We also apply this idea to quadratic residue codes, and prove that their weight polynomials are divisible by $(x + y)^d$, with d being the minimum distance.

These results impose strong conditions on the weight polynomials of quadratic residue codes and QQR codes. Combining the divisibility result and Gleason's Theorem, we can derive an efficient algorithm to compute the weight polynomials of QQR codes. We also use these results to correct the existing computational results for the weight polynomials of quadratic residue codes that were on OEIS. (Received September 25, 2018)