Recent Developments on Permutation Trinomials

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Abstract — Permutation trinomials over finite fields have been a very attractive topic for some time. After a brief introduction to the subject, we will focus on the following recent developments: In 2017, Tu, Zeng, Li, and Helleseth considered trinomials of the form $f(X) = X + aX^{q(q-1)+1} + bX^{2(q-1)+1} \in \mathbb{F}_{q^2}[X]$, where q is even and $a, b \in \mathbb{F}_{q^2}^*$. They found sufficient conditions on a, b for f to be a permutation polynomial (PP) of $\mathbb{F}_{q^2}$ and they conjectured that the sufficient conditions are also necessary. The conjecture has been confirmed by Bartoli using the Hasse-Weil bound. In this talk, we give an alternative solution to the question. We also use the Hasse-Weil bound, but in a different way. Moreover, the necessity and sufficiency of the conditions are proved by the same approach.