r-PRIMITIVE k-NORMAL ELEMENTS IN ARITHMETIC PROGRESSIONS OVER FINITE FIELDS

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Abstract. Let $\mathbb{F}_{q^n}$ be a finite field with q^n elements. For a positive divisor r of $q^n - 1$, the element $\alpha \in \mathbb{F}_{q^n}^*$ is called *r-primitive* if its multiplicative order is $(q^n - 1)/r$. Also, for a non-negative integer k, the element $\alpha \in \mathbb{F}_{q^n}$ is *k-normal* over $\mathbb{F}_q$ if $\gcd(\alpha x^{n-1} + \alpha^q x^{n-2} + \ldots + \alpha^{q^{n-2}} x + \alpha^{q^{n-1}}, x^n - 1)$ in $\mathbb{F}_{q^n}[x]$ has degree k. In this talk we discuss the existence of elements in arithmetic progressions $\{\alpha, \alpha+\beta, \alpha+2\beta, \ldots \alpha+(m-1)\beta\} \subset \mathbb{F}_{q^n}$ with $\alpha+(i-1)\beta$ being r_i-primitive and at least one of the elements in the arithmetic progression being k-normal over $\mathbb{F}_q$. We obtain asymptotic results for general $k, r_1, \ldots, r_m$ and concrete results when $k = r_i = 2$ for $i \in \{1, \ldots, m\}$.