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θ -Semisimple Classes of Type D in $\mathrm{PSL}_n(q)$

Let p be an odd prime, $m \in \mathbb{N}$ and set $q = p^m$, $G = \mathrm{PSL}_n(q)$. Let θ be a standard graph automorphism of G , d be a diagonal automorphism and Fr_q be the Frobenius endomorphism of $\mathrm{PSL}_n(\overline{\mathbb{F}}_q)$. We show that every $(d \circ \theta)$ -conjugacy class of a $(d \circ \theta, p)$ -regular element in G is represented in some Fr_q -stable maximal torus of $\mathrm{PSL}_n(\overline{\mathbb{F}}_q)$ and that most of them are of type D. We write out the possible exceptions and show that, in particular, if $n \geq 5$ is either odd or a multiple of 4 and $q > 7$, then all such classes are of type D. We develop general arguments to deal with twisted classes in finite groups.

Keywords: Hopf algebras, twisted conjugacy classes, finite simple groups.

MSC: 16W30