On maximal partial spread of finite classical polar spaces

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Let $\mathcal{P}$ be a finite classical polar space. A *partial spread* $\mathcal{S}$ of $\mathcal{P}$ is a set of pairwise disjoint generators of $\mathcal{P}$. A partial spread is said to be *maximal* if it maximal with respect to set-theoretic inclusion. A partial spread $\mathcal{S}$ is called a *spread* if $\mathcal{S}$ partitions the point set of $\mathcal{P}$. If a polar space does not admit spreads, the question on the size of a maximal partial spread in such a space naturally arises. In general constructing maximal partial spreads and obtaining reasonable upper and lower bounds for the size of such partial spreads is an interesting problem. Recently maximal partial spreads of symplectic polar spaces received particular attention due to their applications in quantum information theory. In fact they correspond to so-called weakly unextendible mutually unbiased bases [1], [2]. In this talk I will show that, for $n \geq 1$, $\mathcal{H}(4n-1,q^2)$ has a maximal partial spread of size $q^{2n}+1$, $\mathcal{H}(4n+1,q^2)$ has a maximal partial spread of size $q^{2n+1}+1$ and, for $n \geq 2$, $\mathcal{Q}^+(4n-1,q)$, $\mathcal{Q}(4n-2,q)$, $\mathcal{W}(4n-1,q)$, q even, $W(4n-3,q)$, q even, have a maximal partial spread of size q^n+1. These results are obtained by investigating particular Segre varieties $\mathcal{S}_{1,n}$ "embedded" in polar spaces of Hermitian or hyperbolic type.

References

[1] W. M. Kantor, MUB inequivalence and affine planes, *J. Math. Phys.* 53 (3) (2012), 9 pp.

[2] P. Mandayam, S. Bandyopadhyay, M. Grassl, W.K. Wootters, Unextendible mutually unbiased bases from Pauli classes, *Quantum Inf. Comput.* 14 (2014), no. 9-10, 823-844.