The Hermitian variety H(5,4) has no ovoids

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Introduction

- Consider the Hermitian variety $H(2n+1, q^2)$, $n \geqslant 1$.
- An *ovoid* is a set of points $\mathcal{O}$ of $H(2n+1, q^2)$ such that every generator of $H(2n+1, q^2)$ contains exactly one point of $\mathcal{O}$.
- existence?

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Known results

Blokhuis and Moorhouse: $H(2n+1, q^2)$ has no ovoids if

$$p^{2n+1} > \binom{2n+p}{2n+1}^2 - \binom{2n+p-1}{2n+1}^2$$

Ovoids of $H(5, q^2)$ are not excluded.

Klein: $H(2n+1, q^2)$ has no ovoids if $n > q^3$

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The geometry

- Using information on ovoids of $H(3,4)$ and using the same trick of Klein, we find intersectionnumbers of a hypothetical ovoid of $H(5,4)$ with planes.
- To obtain information on ovoids of $H(3,4)$, we rely on $q = 4$.

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Possible extensions?

Penttila; Cimrakova and Fack (independently): classification of ovoids of $H(3,9)$

this may be used to extend the proof for $q = 9$

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