Applications of Computer Algebra – ACA 2021
Virtual. Online | July 23-27, 2021
Session on *"Computer Algebra for Geometry and Combinatorics"*

On (locally Hermitian) ovoids of $H(3, q^2)$

Bart De Bruyn[1] [Bart.DeBruyn@UGent.be]

[1] Department of Mathematics: Algebra and Geometry, Ghent University, Ghent, Belgium

The points and lines of $\mathrm{PG}(3, q^2)$ that are totally isotropic with respect to a given Hermitian polarity of $\mathrm{PG}(3, q^2)$ define a generalized quadrangle which we denote by $H(3, q^2)$. An *ovoid* O of $H(3, q^2)$ is a set of points meeting each line in a *singleton*. Such an ovoid is called *locally Hermitian* if there exists a point x on $H(3, q^2)$ and q^2 lines $L_1, L_2, \ldots, L_{q^2}$ of $\mathrm{PG}(3, q^2)$ through x such that $O = (L_1 \cup L_2 \cup \cdots \cup L_{q^2}) \cap H(3, q^2)$. There exists a connection between locally Hermitian ovoids of $H(3, q^2)$ and so-called indicator sets of the affine plane $\mathrm{AG}(2, q^2)$ [3].

In my talk, I will discuss several new results about (locally Hermitian) ovoids of $H(3, q^2)$ [2]. This includes among others a complete classification of all ovoids of $H(3, 9)$. The results have been obtained or have been inspired by computer computations using a Computer Algebra System.

Keywords
(Locally Hermitian) ovoid, (Hermitian) generalized quadrangle, indicator set

References

[1] A. E. BROUWER; H. A. WILBRINK, *Ovoids and fans in the generalized quadrangle Q(4,2)*. Geom. Dedicata 36 (1990), 121–124.

[2] B. DE BRUYN, *On ovoids of the generalized quadrangle* $H(3, q^2)$. Ann. Comb. 25 (2021), 495–514.

[3] E. SHULT, *Problems by the wayside*. Discrete Math. 294 (2005), 175–201.