

# Ovoids of $SL(2, q)$

Kris Coolsaet  
UGent

SEMINAR INCIDENCE GEOMETRY  
20 November 2009

A partial ovoid of the generalized quadrangle  $Q(4, q)$ ,  $q$  odd, is a set of points of that quadrangle such that no two of them are collinear. The size of a partial ovoid can be at most  $q^2 + 1$  in which case it is called an ovoid. A typical example of an ovoid is the elliptic quadric that is obtained by intersecting  $Q(4, q)$  with an appropriate hyperplane. A partial ovoid is called complete when no point can be added to it without losing its defining property. It can be proved that a partial ovoid of size  $q^2$  can never be complete, so the next smaller cases of interest are the complete partial ovoids of size  $q^2 - 1$ . Jan De Beule and I have been investigating the few known examples of partial ovoids of this type. There turn out to exist interesting relations between these structures and other objects: in particular with root systems, quaternions and the special linear groups. These connections with other branches of mathematics yield various elegant descriptions of the known examples and (hopefully) will bring us closer to a complete classification of these objects.