A subset of the Hermitian surface

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Abstract

In 1832 Jacob Steiner proved that hyperbolic quadrics of a three-dimensional projective space may be generated as locus of the points of intersection of corresponding planes under a projectivity between two pencils of planes. In a finite projective space $\mathbb{P}G(3, q^2)$ over the Galois field $GF(q^2)$, $q$ any prime power, we extend the Steiner approach using an $\alpha$-collineation, with $\alpha$ the involutory automorphism of $GF(q^2)$, instead of a projectivity. In this way we obtain a set of $(q^2 + 1)^2$ points that is of type $(0, 1, 2, q + 1, q^2 + 1)$ with respect to the lines of $\mathbb{P}G(3, q^2)$. Moreover this set is contained in the Hermitian surface of $\mathbb{P}G(3, q^2)$.