

Regular partial conical flocks

Yutake Hiramine*and Norman L. Johnson

Abstract

This article provides a classification of the partial conical flocks in $PG(3, q)$ of $(q-1)$ conics of a quadratic cone which admit a linear regular automorphism group on the conics.

1 Introduction.

Let C be a quadratic cone in $PG(3, q)$ with vertex v_o . A partial flock of C is a set of t conics, $1 \leq t \leq q$ which are mutually skew and lie within $C - \{v_o\}$. Using results of Johnson [10] and Gevaert and Johnson [5], a partial flock of a quadratic cone is equivalent to a translation net of degree $qt + 1$ and order q^2 consisting of t reguli(regulus nets) which mutually share a component(line). The deficiency of the partial flock is $q - t$.

In this article, we consider partial flocks of deficiency 1 on which there is a subgroup of $PGL(4, q)$ that acts regularly on the $(q - 1)$ conics of the partial flock. Such partial flocks are said to be **regular partial conical flocks**.

Our main result is as follows:

Theorem 1 Let P be a regular partial conical flock of deficiency one in $PG(3, q)$. Then P may be extended to a flock of a cone $x_o x_1 = x_2^2$ with planes containing the conics given by $x_o t - x_1 f(t) + x_2 g(t) + x_3 = 0$ for all $t \in GF(q)$, where the functions f and g are determined as follows:

Type I. $g(t) = \alpha t^{1+k}$, $f(t) = \beta t^{1+2k}$ where α, β are constants in $GF(q)$, and k a positive integer.

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