Rank-487 over GF(4)

January 15, 2021

The equation

The equation of the surface is :

$$X_2^3 + X_3^3 + X_0^2X_1 + X_0^2X_3 + X_0X_1^2 + X_1^2X_2 = 0$$

(0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)
The point rank of the equation over GF(4) is 42673

General information

Number of lines	1
Number of points	17
Number of singular points	0
Number of Eckardt points	0
Number of double points	0
Number of single points	5
Number of points off lines	12
Number of Hesse planes	0
Number of axes	0
Type of points on lines	5
Type of lines on points	1^5, 0^{12}

Singular Points

The surface has 0 singular points:

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{38} = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{38} = \mathbf{Pl}(0,0,1,1,1,1)_{198}$$

Rank of lines: (38)
Rank of points on Klein quadric: (198)

Eckardt Points

The surface has 0 Eckardt points:

Double Points

The surface has 0 Double points:
The double points on the surface are:

Single Points

The surface has 5 single points:
The single points on the surface are:

$0:\ P_4 = (1,1,1,1)$ lies on line ℓ_0
$1:\ P_5 = (1,1,0,0)$ lies on line ℓ_0
$2:\ P_{38} = (0,0,1,1)$ lies on line ℓ_0
$3:\ P_{47} = (2,2,1,1)$ lies on line ℓ_0
$4:\ P_{52} = (3,3,1,1)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 12 points not on any line:
The points on the surface but not on lines are:

$0:\ P_0 = (1,0,0,0)$
$1:\ P_1 = (0,1,0,0)$
$2:\ P_{11} = (0,1,1,0)$
$3:\ P_{12} = (1,1,1,0)$
$4:\ P_{23} = (1,0,0,1)$
$5:\ P_{27} = (1,1,0,1)$
$6:\ P_{48} = (3,2,1,1)$
$7:\ P_{51} = (2,3,1,1)$
$8:\ P_{53} = (0,0,2,1)$
$9:\ P_{59} = (2,1,2,1)$
$10:\ P_{69} = (0,0,3,1)$
$11:\ P_{76} = (3,1,3,1)$

Line Intersection Graph

	0
0	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line
in point

The surface has 17 points:
The points on the surface are:

$0:\ P_0 = (1,0,0,0)$
$1:\ P_1 = (0,1,0,0)$
$2:\ P_4 = (1,1,1,1)$
$3:\ P_5 = (1,1,0,0)$
$4:\ P_{11} = (0,1,1,0)$
$5:\ P_{12} = (1,1,1,0)$
$6:\ P_{23} = (1,0,0,1)$
$7:\ P_{27} = (1,1,0,1)$
$8:\ P_{38} = (0,0,1,1)$

$9:\ P_{47} = (2, 2, 1, 1)$
$10:\ P_{48} = (3, 2, 1, 1)$
$11:\ P_{51} = (2, 3, 1, 1)$
$12:\ P_{52} = (3, 3, 1, 1)$
$13:\ P_{53} = (0, 0, 2, 1)$
$14:\ P_{59} = (2, 1, 2, 1)$
$15:\ P_{69} = (0, 0, 3, 1)$
$16:\ P_{76} = (3, 1, 3, 1)$