Rank-66764 over GF(4)

January 15, 2021

The equation

The equation of the surface is :

$$X_0^3 + X_3^3 + X_0^2X_3 + X_0X_1^2 + X_0X_2^2 + X_0X_1X_2 = 0$$

(1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(4) is 1432724890

General information

Number of lines	1
Number of points	17
Number of singular points	2
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 2 singular points:

$0:\ P_{15} = \mathbf{P}(0, \omega, 1, 0) = \mathbf{P}(0, 2, 1, 0)$
$1:\ P_{19} = \mathbf{P}(0, \omega^2, 1, 0) = \mathbf{P}(0, 3, 1, 0)$

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{336} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{336} = \mathbf{Pl}(0,0,0,0,0,1)_{101}$$

Rank of lines: (336)
Rank of points on Klein quadric: (101)

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:

$0: P_1 = (0,1,0,0)$ lies on line ℓ_0
$1: P_2 = (0,0,1,0)$ lies on line ℓ_0
$2: P_{11} = (0,1,1,0)$ lies on line ℓ_0
$3: P_{15} = (0,2,1,0)$ lies on line ℓ_0
$4: P_{19} = (0,3,1,0)$ 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:

$0: P_4 = (1,1,1,1)$
$1: P_5 = (1,1,0,0)$
$2: P_8 = (1,0,1,0)$
$3: P_{12} = (1,1,1,0)$
$4: P_{27} = (1,1,0,1)$
$5: P_{33} = (3,2,0,1)$
$6: P_{36} = (2,3,0,1)$
$7: P_{39} = (1,0,1,1)$
$8: P_{56} = (3,0,2,1)$
$9: P_{64} = (3,2,2,1)$
$10: P_{71} = (2,0,3,1)$
$11: P_{83} = (2,3,3,1)$

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:

$0: P_1 = (0,1,0,0)$
$1: P_2 = (0,0,1,0)$
$2: P_4 = (1,1,1,1)$
$3: P_5 = (1,1,0,0)$
$4: P_8 = (1,0,1,0)$
$5: P_{11} = (0,1,1,0)$
$6: P_{12} = (1,1,1,0)$
$7: P_{15} = (0,2,1,0)$
$8: P_{19} = (0,3,1,0)$
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$14: P_{64} = (3,2,2,1)$
$15: P_{71} = (2,0,3,1)$
$16: P_{83} = (2,3,3,1)$