

Rank-66764 over GF(2)

January 15, 2021

The equation

The equation of the surface is :

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

(1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0)

The point rank of the equation over GF(2) is 66764

General information

Number of lines	1
Number of points	9
Number of singular points	0
Number of Eckardt points	0
Number of double points	0
Number of single points	3
Number of points off lines	6
Number of Hesse planes	0
Number of axes	0
Type of points on lines	3
Type of lines on points	$1^3, 0^6$

Singular Points

The surface has 0 singular points:

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{28} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{28} = \mathbf{Pl}(0, 0, 0, 0, 0, 1)_{19}$$

Rank of lines: (28)

Rank of points on Klein quadric: (19)

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 3 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 : $P_7 = (0, 1, 1, 0)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 6 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 : $P_6 = (1, 0, 1, 0)$

3 : $P_8 = (1, 1, 1, 0)$

4 : $P_{11} = (1, 1, 0, 1)$

5 : $P_{13} = (1, 0, 1, 1)$

Line Intersection Graph

$$\begin{array}{c|c} & 0 \\ \hline 0 & 0 \end{array}$$

Neighbor sets in the line intersection graph:

Line 0 intersects

Line
in point

The surface has 9 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 : $P_6 = (1, 0, 1, 0)$

5 : $P_7 = (0, 1, 1, 0)$

6 : $P_8 = (1, 1, 1, 0)$

7 : $P_{11} = (1, 1, 0, 1)$

8 : $P_{13} = (1, 0, 1, 1)$