Rank-74247 over GF(2)

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The equation

The equation of the surface is :

$$X_2^3 + X_1^2X_3 + X_0X_3^2 + X_0X_1X_2 = 0$$

(0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(2) is 74247

General information

Number of lines	3
Number of points	9
Number of singular points	1
Number of Eckardt points	0
Number of double points	3
Number of single points	3
Number of points off lines	3
Number of Hesse planes	0
Number of axes	0
Type of points on lines	3^3
Type of lines on points	2^3, 1^3, 0^3

Singular Points

The surface has 1 singular points:

$0:\ P_0 = \mathbf{P}(1,0,0,0) = \mathbf{P}(1,0,0,0)$

The 3 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}_0 = \mathbf{Pl}(1,0,0,0,0,0)_0$$

$$\ell_1 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}_3 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix}_3 = \mathbf{Pl}(1,0,1,0,1,0)_{13}$$

$$\ell_2 = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{24} = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{24} = \mathbf{Pl}(1,0,1,1,1,1)_{33}$$

Rank of lines: (0, 3, 24)
Rank of points on Klein quadric: (0, 13, 33)

Eckardt Points

The surface has 0 Eckardt points:

Double Points

The surface has 3 Double points:
The double points on the surface are:

$P_0 = (1,0,0,0) = \ell_0 \cap \ell_1$
$P_5 = (1,1,0,0) = \ell_0 \cap \ell_2$
$P_{14} = (0,1,1,1) = \ell_1 \cap \ell_2$

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
$1:\ P_4 = (1,1,1,1)$ lies on line ℓ_1
$2:\ P_{13} = (1,0,1,1)$ lies on line ℓ_2

The single points on the surface are:

Points on surface but on no line

The surface has 3 points not on any line:
The points on the surface but not on lines are:

$0:\ P_3 = (0,0,0,1)$
$1:\ P_8 = (1,1,1,0)$
$2:\ P_{11} = (1,1,0,1)$

Line Intersection Graph

	0	1	2
0	0	1	1
1	1	0	1
2	1	1	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line	ℓ_1	ℓ_2
in point	P_0	P_5

Line 1 intersects

Line	ℓ_0	ℓ_2
in point	P_0	P_{14}

Line 2 intersects

Line	ℓ_0	ℓ_1
in point	P_5	P_{14}

The surface has 9 points:
The points on the surface are:

$0: P_0 = (1,0,0,0)$
$1: P_1 = (0,1,0,0)$
$2: P_3 = (0,0,0,1)$
$3: P_4 = (1,1,1,1)$
$4: P_5 = (1,1,0,0)$
$5: P_8 = (1,1,1,0)$
$6: P_{11} = (1,1,0,1)$
$7: P_{13} = (1,0,1,1)$
$8: P_{14} = (0,1,1,1)$