Rank-74296 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

$$X_0^3 + X_2^3 + X_0^2X_1 + X_0^2X_2 + X_1^2X_3 + X_0X_3^2 + X_0X_1X_2 = 0$$

(1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is 1361388174

General information

Number of lines	1
Number of points	73
Number of singular points	1
Number of Eckardt points	0
Number of double points	0
Number of single points	9
Number of points off lines	64
Number of Hesse planes	0
Number of axes	0
Type of points on lines	9
Type of lines on points	1^9, 0^{64}

Singular Points

The surface has 1 singular points:

$0 : \ P_{139} = \mathbf{P}(1,0,1,1) = \mathbf{P}(1,0,1,1)$

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{666} = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{666} = \mathbf{Pl}(1,0,1,1,1,1)_{1323}$$

Rank of lines: (666)
Rank of points on Klein quadric: (1323)

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

0 : $P_5 = (1,1,0,0)$ lies on line ℓ_0
1 : $P_{139} = (1,0,1,1)$ lies on line ℓ_0
2 : $P_{146} = (0,1,1,1)$ lies on line ℓ_0
3 : $P_{156} = (3,2,1,1)$ lies on line ℓ_0
4 : $P_{163} = (2,3,1,1)$ lies on line ℓ_0
5 : $P_{174} = (5,4,1,1)$ lies on line ℓ_0
6 : $P_{181} = (4,5,1,1)$ lies on line ℓ_0
7 : $P_{192} = (7,6,1,1)$ lies on line ℓ_0
8 : $P_{199} = (6,7,1,1)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 64 points not on any line:
The points on the surface but not on lines are:

0 : $P_1 = (0,1,0,0)$
1 : $P_3 = (0,0,0,1)$
2 : $P_{13} = (2,0,1,0)$
3 : $P_{15} = (4,0,1,0)$
4 : $P_{18} = (7,0,1,0)$
5 : $P_{22} = (3,1,1,0)$
6 : $P_{24} = (5,1,1,0)$
7 : $P_{25} = (6,1,1,0)$
8 : $P_{75} = (1,0,0,1)$
9 : $P_{83} = (1,1,0,1)$
10 : $P_{159} = (6,2,1,1)$
11 : $P_{168} = (7,3,1,1)$
12 : $P_{172} = (3,4,1,1)$
13 : $P_{179} = (2,5,1,1)$
14 : $P_{189} = (4,6,1,1)$
15 : $P_{198} = (5,7,1,1)$
16 : $P_{225} = (0,3,2,1)$
17 : $P_{235} = (2,4,2,1)$
18 : $P_{239} = (6,4,2,1)$
19 : $P_{254} = (5,6,2,1)$
20 : $P_{255} = (6,6,2,1)$
21 : $P_{256} = (7,6,2,1)$
22 : $P_{262} = (5,7,2,1)$
23 : $P_{264} = (7,7,2,1)$
24 : $P_{272} = (7,0,3,1)$
25 : $P_{276} = (3,1,3,1)$
26 : $P_{294} = (5,3,3,1)$
27 : $P_{306} = (1,5,3,1)$
28 : $P_{320} = (7,6,3,1)$
29 : $P_{321} = (0,7,3,1)$
30 : $P_{322} = (1,7,3,1)$
31 : $P_{326} = (5,7,3,1)$
32 : $P_{347} = (2,2,4,1)$
33 : $P_{351} = (6,2,4,1)$
34 : $P_{355} = (2,3,4,1)$
35 : $P_{356} = (3,3,4,1)$

36 : $P_{359} = (6, 3, 4, 1)$
37 : $P_{369} = (0, 5, 4, 1)$
38 : $P_{388} = (3, 7, 4, 1)$
39 : $P_{389} = (4, 7, 4, 1)$
40 : $P_{395} = (2, 0, 5, 1)$
41 : $P_{406} = (5, 1, 5, 1)$
42 : $P_{409} = (0, 2, 5, 1)$
43 : $P_{410} = (1, 2, 5, 1)$
44 : $P_{415} = (6, 2, 5, 1)$
45 : $P_{419} = (2, 3, 5, 1)$
46 : $P_{439} = (6, 5, 5, 1)$
47 : $P_{442} = (1, 6, 5, 1)$
48 : $P_{461} = (4, 0, 6, 1)$
49 : $P_{471} = (6, 1, 6, 1)$
50 : $P_{482} = (1, 3, 6, 1)$
51 : $P_{489} = (0, 4, 6, 1)$
52 : $P_{490} = (1, 4, 6, 1)$
53 : $P_{492} = (3, 4, 6, 1)$
54 : $P_{501} = (4, 5, 6, 1)$
55 : $P_{508} = (3, 6, 6, 1)$
56 : $P_{542} = (5, 2, 7, 1)$
57 : $P_{544} = (7, 2, 7, 1)$
58 : $P_{556} = (3, 4, 7, 1)$
59 : $P_{557} = (4, 4, 7, 1)$
60 : $P_{564} = (3, 5, 7, 1)$
61 : $P_{565} = (4, 5, 7, 1)$
62 : $P_{566} = (5, 5, 7, 1)$
63 : $P_{569} = (0, 6, 7, 1)$

Line Intersection Graph

	0
0	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line
in point

The surface has 73 points:
The points on the surface are:

0 : $P_{1} = (0, 1, 0, 0)$
1 : $P_{3} = (0, 0, 0, 1)$
2 : $P_{5} = (1, 1, 0, 0)$
3 : $P_{13} = (2, 0, 1, 0)$
4 : $P_{15} = (4, 0, 1, 0)$
5 : $P_{18} = (7, 0, 1, 0)$
6 : $P_{22} = (3, 1, 1, 0)$
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