Rank-65915 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

(0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is 1244210253

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:

$0: \ P_2 = \mathbf{P}(0,0,1,0) = \mathbf{P}(0,0,1,0)$

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{593} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \end{bmatrix}_{593} = \mathbf{Pl}(1,1,1,1,1,0)_{306}$$

Rank of lines: (593)
Rank of points on Klein quadric: (306)

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 : $P_{20} = (1, 1, 1, 0)$ lies on line ℓ_0
1 : $P_{75} = (1, 0, 0, 1)$ lies on line ℓ_0
2 : $P_{146} = (0, 1, 1, 1)$ lies on line ℓ_0
3 : $P_{220} = (3, 2, 2, 1)$ lies on line ℓ_0
4 : $P_{291} = (2, 3, 3, 1)$ lies on line ℓ_0
5 : $P_{366} = (5, 4, 4, 1)$ lies on line ℓ_0
6 : $P_{437} = (4, 5, 5, 1)$ lies on line ℓ_0
7 : $P_{512} = (7, 6, 6, 1)$ lies on line ℓ_0
8 : $P_{583} = (6, 7, 7, 1)$ 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 : $P_0 = (1, 0, 0, 0)$
1 : $P_1 = (0, 1, 0, 0)$
2 : $P_2 = (0, 0, 1, 0)$
3 : $P_4 = (1, 1, 1, 1)$
4 : $P_{30} = (3, 2, 1, 0)$
5 : $P_{33} = (6, 2, 1, 0)$
6 : $P_{46} = (3, 4, 1, 0)$
7 : $P_{48} = (5, 4, 1, 0)$
8 : $P_{72} = (5, 7, 1, 0)$
9 : $P_{73} = (6, 7, 1, 0)$
10 : $P_{92} = (2, 2, 0, 1)$
11 : $P_{103} = (5, 3, 0, 1)$
12 : $P_{110} = (4, 4, 0, 1)$
13 : $P_{120} = (6, 5, 0, 1)$
14 : $P_{125} = (3, 6, 0, 1)$
15 : $P_{137} = (7, 7, 0, 1)$
16 : $P_{203} = (2, 0, 2, 1)$
17 : $P_{224} = (7, 2, 2, 1)$
18 : $P_{226} = (1, 3, 2, 1)$
19 : $P_{234} = (1, 4, 2, 1)$
20 : $P_{240} = (7, 4, 2, 1)$
21 : $P_{241} = (0, 5, 2, 1)$
22 : $P_{244} = (3, 5, 2, 1)$
23 : $P_{270} = (5, 0, 3, 1)$
24 : $P_{279} = (6, 1, 3, 1)$
25 : $P_{280} = (7, 1, 3, 1)$
26 : $P_{281} = (0, 2, 3, 1)$
27 : $P_{296} = (7, 3, 3, 1)$
28 : $P_{315} = (2, 6, 3, 1)$
29 : $P_{319} = (6, 6, 3, 1)$
30 : $P_{324} = (3, 7, 3, 1)$
31 : $P_{326} = (5, 7, 3, 1)$
32 : $P_{333} = (4, 0, 4, 1)$
33 : $P_{363} = (2, 4, 4, 1)$
34 : $P_{370} = (1, 5, 4, 1)$
35 : $P_{377} = (0, 6, 4, 1)$

36 : $P_{382} = (5, 6, 4, 1)$
37 : $P_{386} = (1, 7, 4, 1)$
38 : $P_{387} = (2, 7, 4, 1)$
39 : $P_{399} = (6, 0, 5, 1)$
40 : $P_{403} = (2, 1, 5, 1)$
41 : $P_{404} = (3, 1, 5, 1)$
42 : $P_{414} = (5, 2, 5, 1)$
43 : $P_{415} = (6, 2, 5, 1)$
44 : $P_{420} = (3, 3, 5, 1)$
45 : $P_{421} = (4, 3, 5, 1)$
46 : $P_{425} = (0, 4, 5, 1)$
47 : $P_{435} = (2, 5, 5, 1)$
48 : $P_{460} = (3, 0, 6, 1)$
49 : $P_{469} = (4, 1, 6, 1)$
50 : $P_{470} = (5, 1, 6, 1)$
51 : $P_{492} = (3, 4, 6, 1)$
52 : $P_{495} = (6, 4, 6, 1)$
53 : $P_{502} = (5, 5, 6, 1)$
54 : $P_{504} = (7, 5, 6, 1)$
55 : $P_{509} = (4, 6, 6, 1)$
56 : $P_{513} = (0, 7, 6, 1)$
57 : $P_{528} = (7, 0, 7, 1)$
58 : $P_{538} = (1, 2, 7, 1)$
59 : $P_{541} = (4, 2, 7, 1)$
60 : $P_{545} = (0, 3, 7, 1)$
61 : $P_{551} = (6, 3, 7, 1)$
62 : $P_{570} = (1, 6, 7, 1)$
63 : $P_{581} = (4, 7, 7, 1)$

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:

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