Rank-65919 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

(0, 0, 1, 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 1244210317

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:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{65} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{65} = \mathbf{Pl}(0,0,1,0,1,0)_{96}$$

Rank of lines: (65)
Rank of points on Klein quadric: (96)

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 : $P_0 = (1,0,0,0)$ lies on line ℓ_0
1 : $P_{138} = (0,0,1,1)$ lies on line ℓ_0
2 : $P_{139} = (1,0,1,1)$ lies on line ℓ_0
3 : $P_{140} = (2,0,1,1)$ lies on line ℓ_0
4 : $P_{141} = (3,0,1,1)$ lies on line ℓ_0
5 : $P_{142} = (4,0,1,1)$ lies on line ℓ_0
6 : $P_{143} = (5,0,1,1)$ lies on line ℓ_0
7 : $P_{144} = (6,0,1,1)$ lies on line ℓ_0
8 : $P_{145} = (7,0,1,1)$ 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 : $P_{12} = (1,0,1,0)$
2 : $P_{19} = (0,1,1,0)$
3 : $P_{29} = (2,2,1,0)$
4 : $P_{34} = (7,2,1,0)$
5 : $P_{45} = (2,4,1,0)$
6 : $P_{47} = (4,4,1,0)$
7 : $P_{71} = (4,7,1,0)$
8 : $P_{74} = (7,7,1,0)$
9 : $P_{75} = (1,0,0,1)$
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 : $P_{165} = (4,3,1,1)$
17 : $P_{166} = (5,3,1,1)$
18 : $P_{183} = (6,5,1,1)$
19 : $P_{184} = (7,5,1,1)$
20 : $P_{187} = (2,6,1,1)$
21 : $P_{188} = (3,6,1,1)$
22 : $P_{205} = (4,0,2,1)$
23 : $P_{213} = (4,1,2,1)$
24 : $P_{214} = (5,1,2,1)$
25 : $P_{219} = (2,2,2,1)$
26 : $P_{223} = (6,2,2,1)$
27 : $P_{231} = (6,3,2,1)$
28 : $P_{257} = (0,7,2,1)$
29 : $P_{262} = (5,7,2,1)$
30 : $P_{269} = (4,0,3,1)$
31 : $P_{273} = (0,1,3,1)$
32 : $P_{274} = (1,1,3,1)$
33 : $P_{285} = (4,2,3,1)$
34 : $P_{298} = (1,4,3,1)$
35 : $P_{300} = (3,4,3,1)$

36 : $P_{336} = (7, 0, 4, 1)$
37 : $P_{343} = (6, 1, 4, 1)$
38 : $P_{344} = (7, 1, 4, 1)$
39 : $P_{345} = (0, 2, 4, 1)$
40 : $P_{351} = (6, 2, 4, 1)$
41 : $P_{364} = (3, 4, 4, 1)$
42 : $P_{365} = (4, 4, 4, 1)$
43 : $P_{372} = (3, 5, 4, 1)$
44 : $P_{400} = (7, 0, 5, 1)$
45 : $P_{401} = (0, 1, 5, 1)$
46 : $P_{402} = (1, 1, 5, 1)$
47 : $P_{432} = (7, 4, 5, 1)$
48 : $P_{450} = (1, 7, 5, 1)$
49 : $P_{454} = (5, 7, 5, 1)$
50 : $P_{459} = (2, 0, 6, 1)$
51 : $P_{465} = (0, 1, 6, 1)$
52 : $P_{466} = (1, 1, 6, 1)$
53 : $P_{474} = (1, 2, 6, 1)$
54 : $P_{479} = (6, 2, 6, 1)$
55 : $P_{515} = (2, 7, 6, 1)$
56 : $P_{523} = (2, 0, 7, 1)$
57 : $P_{531} = (2, 1, 7, 1)$
58 : $P_{532} = (3, 1, 7, 1)$
59 : $P_{553} = (0, 4, 7, 1)$
60 : $P_{556} = (3, 4, 7, 1)$
61 : $P_{574} = (5, 6, 7, 1)$
62 : $P_{582} = (5, 7, 7, 1)$
63 : $P_{584} = (7, 7, 7, 1)$

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:

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