Rank-65569 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

(0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is 1227138197

General information

Number of lines	1
Number of points	73
Number of singular points	0
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 0 singular points:

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:

$0:\ P_5 = (1,1,0,0)$
$1:\ P_{19} = (0,1,1,0)$
$2:\ P_{20} = (1,1,1,0)$
$3:\ P_{82} = (0,1,0,1)$
$4:\ P_{97} = (7,2,0,1)$
$5:\ P_{99} = (1,3,0,1)$
$6:\ P_{108} = (2,4,0,1)$
$7:\ P_{115} = (1,5,0,1)$
$8:\ P_{123} = (1,6,0,1)$
$9:\ P_{134} = (4,7,0,1)$
$10:\ P_{167} = (6,3,1,1)$
$11:\ P_{168} = (7,3,1,1)$
$12:\ P_{179} = (2,5,1,1)$
$13:\ P_{180} = (3,5,1,1)$
$14:\ P_{189} = (4,6,1,1)$
$15:\ P_{190} = (5,6,1,1)$
$16:\ P_{229} = (4,3,2,1)$
$17:\ P_{231} = (6,3,2,1)$
$18:\ P_{241} = (0,5,2,1)$
$19:\ P_{243} = (2,5,2,1)$
$20:\ P_{262} = (5,7,2,1)$
$21:\ P_{264} = (7,7,2,1)$
$22:\ P_{274} = (1,1,3,1)$
$23:\ P_{275} = (2,1,3,1)$
$24:\ P_{294} = (5,3,3,1)$
$25:\ P_{295} = (6,3,3,1)$
$26:\ P_{298} = (1,4,3,1)$
$27:\ P_{299} = (2,4,3,1)$
$28:\ P_{306} = (1,5,3,1)$
$29:\ P_{307} = (2,5,3,1)$
$30:\ P_{321} = (0,7,3,1)$
$31:\ P_{324} = (3,7,3,1)$
$32:\ P_{347} = (2,2,4,1)$
$33:\ P_{351} = (6,2,4,1)$
$34:\ P_{372} = (3,5,4,1)$
$35:\ P_{376} = (7,5,4,1)$
$36:\ P_{377} = (0,6,4,1)$
$37:\ P_{381} = (4,6,4,1)$
$38:\ P_{402} = (1,1,5,1)$
$39:\ P_{405} = (4,1,5,1)$
$40:\ P_{409} = (0,2,5,1)$
$41:\ P_{414} = (5,2,5,1)$
$42:\ P_{436} = (3,5,5,1)$
$43:\ P_{439} = (6,5,5,1)$

44 : $P_{442} = (1, 6, 5, 1)$
45 : $P_{445} = (4, 6, 5, 1)$
46 : $P_{450} = (1, 7, 5, 1)$
47 : $P_{453} = (4, 7, 5, 1)$
48 : $P_{466} = (1, 1, 6, 1)$
49 : $P_{472} = (7, 1, 6, 1)$
50 : $P_{474} = (1, 2, 6, 1)$
51 : $P_{480} = (7, 2, 6, 1)$
52 : $P_{482} = (1, 3, 6, 1)$
53 : $P_{488} = (7, 3, 6, 1)$
54 : $P_{489} = (0, 4, 6, 1)$
55 : $P_{495} = (6, 4, 6, 1)$
56 : $P_{508} = (3, 6, 6, 1)$
57 : $P_{510} = (5, 6, 6, 1)$
58 : $P_{545} = (0, 3, 7, 1)$
59 : $P_{552} = (7, 3, 7, 1)$
60 : $P_{556} = (3, 4, 7, 1)$
61 : $P_{557} = (4, 4, 7, 1)$
62 : $P_{571} = (2, 6, 7, 1)$
63 : $P_{574} = (5, 6, 7, 1)$

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 : $P_{0} = (1, 0, 0, 0)$
1 : $P_{5} = (1, 1, 0, 0)$
2 : $P_{19} = (0, 1, 1, 0)$
3 : $P_{20} = (1, 1, 1, 0)$
4 : $P_{82} = (0, 1, 0, 1)$
5 : $P_{97} = (7, 2, 0, 1)$
6 : $P_{99} = (1, 3, 0, 1)$
7 : $P_{108} = (2, 4, 0, 1)$
8 : $P_{115} = (1, 5, 0, 1)$
9 : $P_{123} = (1, 6, 0, 1)$
10 : $P_{134} = (4, 7, 0, 1)$
11 : $P_{138} = (0, 0, 1, 1)$
12 : $P_{139} = (1, 0, 1, 1)$
13 : $P_{140} = (2, 0, 1, 1)$
14 : $P_{141} = (3, 0, 1, 1)$
15 : $P_{142} = (4, 0, 1, 1)$
16 : $P_{143} = (5, 0, 1, 1)$
17 : $P_{144} = (6, 0, 1, 1)$
18 : $P_{145} = (7, 0, 1, 1)$
19 : $P_{167} = (6, 3, 1, 1)$
20 : $P_{168} = (7, 3, 1, 1)$
21 : $P_{179} = (2, 5, 1, 1)$
22 : $P_{180} = (3, 5, 1, 1)$
23 : $P_{189} = (4, 6, 1, 1)$
24 : $P_{190} = (5, 6, 1, 1)$
25 : $P_{229} = (4, 3, 2, 1)$
26 : $P_{231} = (6, 3, 2, 1)$
27 : $P_{241} = (0, 5, 2, 1)$
28 : $P_{243} = (2, 5, 2, 1)$
29 : $P_{262} = (5, 7, 2, 1)$
30 : $P_{264} = (7, 7, 2, 1)$
31 : $P_{274} = (1, 1, 3, 1)$
32 : $P_{275} = (2, 1, 3, 1)$
33 : $P_{294} = (5, 3, 3, 1)$
34 : $P_{295} = (6, 3, 3, 1)$
35 : $P_{298} = (1, 4, 3, 1)$
36 : $P_{299} = (2, 4, 3, 1)$
37 : $P_{306} = (1, 5, 3, 1)$
38 : $P_{307} = (2, 5, 3, 1)$
39 : $P_{321} = (0, 7, 3, 1)$
40 : $P_{324} = (3, 7, 3, 1)$
41 : $P_{347} = (2, 2, 4, 1)$
42 : $P_{351} = (6, 2, 4, 1)$
43 : $P_{372} = (3, 5, 4, 1)$
44 : $P_{376} = (7, 5, 4, 1)$
45 : $P_{377} = (0, 6, 4, 1)$
46 : $P_{381} = (4, 6, 4, 1)$
47 : $P_{402} = (1, 1, 5, 1)$
48 : $P_{405} = (4, 1, 5, 1)$
49 : $P_{409} = (0, 2, 5, 1)$
50 : $P_{414} = (5, 2, 5, 1)$
51 : $P_{436} = (3, 5, 5, 1)$
52 : $P_{439} = (6, 5, 5, 1)$
53 : $P_{442} = (1, 6, 5, 1)$
54 : $P_{445} = (4, 6, 5, 1)$
55 : $P_{450} = (1, 7, 5, 1)$
56 : $P_{453} = (4, 7, 5, 1)$
57 : $P_{466} = (1, 1, 6, 1)$
58 : $P_{472} = (7, 1, 6, 1)$
59 : $P_{474} = (1, 2, 6, 1)$
60 : $P_{480} = (7, 2, 6, 1)$
61 : $P_{482} = (1, 3, 6, 1)$
62 : $P_{488} = (7, 3, 6, 1)$
63 : $P_{489} = (0, 4, 6, 1)$
64 : $P_{495} = (6, 4, 6, 1)$
65 : $P_{508} = (3, 6, 6, 1)$
66 : $P_{510} = (5, 6, 6, 1)$
67 : $P_{545} = (0, 3, 7, 1)$
68 : $P_{552} = (7, 3, 7, 1)$
69 : $P_{556} = (3, 4, 7, 1)$
70 : $P_{557} = (4, 4, 7, 1)$
71 : $P_{571} = (2, 6, 7, 1)$
72 : $P_{574} = (5, 6, 7, 1)$