Rank-65570 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

(1, 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 1227138198

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:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}_{81} = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}_{81} = \mathbf{Pl}(1,1,0,0,1,1)_{1217}$$

Rank of lines: (81)
Rank of points on Klein quadric: (1217)

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:

$0: P_4 = (1,1,1,1)$ lies on line ℓ_0
$1: P_{12} = (1,0,1,0)$ lies on line ℓ_0
$2: P_{82} = (0,1,0,1)$ lies on line ℓ_0
$3: P_{211} = (2,1,2,1)$ lies on line ℓ_0
$4: P_{276} = (3,1,3,1)$ lies on line ℓ_0
$5: P_{341} = (4,1,4,1)$ lies on line ℓ_0
$6: P_{406} = (5,1,5,1)$ lies on line ℓ_0
$7: P_{471} = (6,1,6,1)$ lies on line ℓ_0
$8: P_{536} = (7,1,7,1)$ 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:

$0: P_6 = (2,1,0,0)$
$1: P_8 = (4,1,0,0)$
$2: P_{11} = (7,1,0,0)$
$3: P_{19} = (0,1,1,0)$
$4: P_{29} = (2,2,1,0)$
$5: P_{34} = (7,2,1,0)$
$6: P_{39} = (4,3,1,0)$
$7: P_{45} = (2,4,1,0)$
$8: P_{47} = (4,4,1,0)$
$9: P_{58} = (7,5,1,0)$
$10: P_{61} = (2,6,1,0)$
$11: P_{71} = (4,7,1,0)$
$12: P_{74} = (7,7,1,0)$
$13: P_{75} = (1,0,0,1)$
$14: P_{83} = (1,1,0,1)$
$15: P_{103} = (5,3,0,1)$
$16: P_{120} = (6,5,0,1)$
$17: P_{125} = (3,6,0,1)$
$18: P_{138} = (0,0,1,1)$
$19: P_{163} = (2,3,1,1)$
$20: P_{181} = (4,5,1,1)$
$21: P_{192} = (7,6,1,1)$
$22: P_{206} = (5,0,2,1)$
$23: P_{214} = (5,1,2,1)$
$24: P_{215} = (6,1,2,1)$
$25: P_{224} = (7,2,2,1)$
$26: P_{239} = (6,4,2,1)$
$27: P_{241} = (0,5,2,1)$
$28: P_{244} = (3,5,2,1)$
$29: P_{247} = (6,5,2,1)$
$30: P_{272} = (7,0,3,1)$
$31: P_{293} = (4,3,3,1)$
$32: P_{310} = (5,5,3,1)$
$33: P_{312} = (7,5,3,1)$
$34: P_{315} = (2,6,3,1)$
$35: P_{321} = (0,7,3,1)$
$36: P_{335} = (6,0,4,1)$
$37: P_{340} = (3,1,4,1)$
$38: P_{343} = (6,1,4,1)$
$39: P_{363} = (2,4,4,1)$
$40: P_{377} = (0,6,4,1)$
$41: P_{380} = (3,6,4,1)$
$42: P_{382} = (5,6,4,1)$
$43: P_{388} = (3,7,4,1)$

44 : $P_{395} = (2, 0, 5, 1)$
45 : $P_{409} = (0, 2, 5, 1)$
46 : $P_{421} = (4, 3, 5, 1)$
47 : $P_{440} = (7, 5, 5, 1)$
48 : $P_{443} = (2, 6, 5, 1)$
49 : $P_{447} = (6, 6, 5, 1)$
50 : $P_{461} = (4, 0, 6, 1)$
51 : $P_{484} = (3, 3, 6, 1)$
52 : $P_{485} = (4, 3, 6, 1)$
53 : $P_{489} = (0, 4, 6, 1)$
54 : $P_{504} = (7, 5, 6, 1)$
55 : $P_{507} = (2, 6, 6, 1)$
56 : $P_{524} = (3, 0, 7, 1)$
57 : $P_{532} = (3, 1, 7, 1)$
58 : $P_{534} = (5, 1, 7, 1)$
59 : $P_{542} = (5, 2, 7, 1)$
60 : $P_{545} = (0, 3, 7, 1)$
61 : $P_{550} = (5, 3, 7, 1)$
62 : $P_{551} = (6, 3, 7, 1)$
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:

0 : $P_{4} = (1, 1, 1, 1)$
1 : $P_{6} = (2, 1, 0, 0)$
2 : $P_{8} = (4, 1, 0, 0)$
3 : $P_{11} = (7, 1, 0, 0)$
4 : $P_{12} = (1, 0, 1, 0)$
5 : $P_{19} = (0, 1, 1, 0)$
6 : $P_{29} = (2, 2, 1, 0)$
7 : $P_{34} = (7, 2, 1, 0)$
8 : $P_{39} = (4, 3, 1, 0)$
9 : $P_{45} = (2, 4, 1, 0)$
10 : $P_{47} = (4, 4, 1, 0)$
11 : $P_{58} = (7, 5, 1, 0)$
12 : $P_{61} = (2, 6, 1, 0)$
13 : $P_{71} = (4, 7, 1, 0)$
14 : $P_{74} = (7, 7, 1, 0)$
15 : $P_{75} = (1, 0, 0, 1)$
16 : $P_{82} = (0, 1, 0, 1)$
17 : $P_{83} = (1, 1, 0, 1)$
18 : $P_{103} = (5, 3, 0, 1)$
19 : $P_{120} = (6, 5, 0, 1)$
20 : $P_{125} = (3, 6, 0, 1)$
21 : $P_{138} = (0, 0, 1, 1)$
22 : $P_{163} = (2, 3, 1, 1)$
23 : $P_{181} = (4, 5, 1, 1)$
24 : $P_{192} = (7, 6, 1, 1)$
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38 : $P_{312} = (7, 5, 3, 1)$
39 : $P_{315} = (2, 6, 3, 1)$
40 : $P_{321} = (0, 7, 3, 1)$
41 : $P_{335} = (6, 0, 4, 1)$
42 : $P_{340} = (3, 1, 4, 1)$
43 : $P_{341} = (4, 1, 4, 1)$
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47 : $P_{380} = (3, 6, 4, 1)$
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50 : $P_{395} = (2, 0, 5, 1)$
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67 : $P_{536} = (7, 1, 7, 1)$
68 : $P_{542} = (5, 2, 7, 1)$
69 : $P_{545} = (0, 3, 7, 1)$
70 : $P_{550} = (5, 3, 7, 1)$
71 : $P_{551} = (6, 3, 7, 1)$
72 : $P_{581} = (4, 7, 7, 1)$