Rank-76323 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

$$X_0^2X_2 + X_1^2X_3 + X_1X_2^2 + X_0X_3^2 + X_0X_1X_2 = 0$$

(0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is 1361384013

General information

Number of lines	2
Number of points	81
Number of singular points	0
Number of Eckardt points	0
Number of double points	0
Number of single points	18
Number of points off lines	63
Number of Hesse planes	0
Number of axes	0
Type of points on lines	9^2
Type of lines on points	1^{18}, 0^{63}

Singular Points

The surface has 0 singular points:

The 2 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}_0 = \mathbf{Pl}(1,0,0,0,0,0)_0$$

$$\ell_1 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4744} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}_{4744} = \mathbf{Pl}(0,1,0,0,0,0)_1$$

Rank of lines: (0, 4744)
Rank of points on Klein quadric: (0, 1)

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

$0: P_0 = (1,0,0,0)$ lies on line ℓ_0
$1: P_1 = (0,1,0,0)$ lies on line ℓ_0
$2: P_2 = (0,0,1,0)$ lies on line ℓ_1
$3: P_3 = (0,0,0,1)$ lies on line ℓ_1
$4: P_5 = (1,1,0,0)$ lies on line ℓ_0
$5: P_6 = (2,1,0,0)$ lies on line ℓ_0
$6: P_7 = (3,1,0,0)$ lies on line ℓ_0
$7: P_8 = (4,1,0,0)$ lies on line ℓ_0
$8: P_9 = (5,1,0,0)$ lies on line ℓ_0
$9: P_{10} = (6,1,0,0)$ lies on line ℓ_0
$10: P_{11} = (7,1,0,0)$ lies on line ℓ_0
$11: P_{138} = (0,0,1,1)$ lies on line ℓ_1
$12: P_{201} = (0,0,2,1)$ lies on line ℓ_1
$13: P_{265} = (0,0,3,1)$ lies on line ℓ_1
$14: P_{329} = (0,0,4,1)$ lies on line ℓ_1
$15: P_{393} = (0,0,5,1)$ lies on line ℓ_1
$16: P_{457} = (0,0,6,1)$ lies on line ℓ_1
$17: P_{521} = (0,0,7,1)$ lies on line ℓ_1

The single points on the surface are:

Points on surface but on no line

The surface has 63 points not on any line:
The points on the surface but not on lines are:

$0: P_{31} = (4,2,1,0)$
$1: P_{33} = (6,2,1,0)$
$2: P_{46} = (3,4,1,0)$
$3: P_{50} = (7,4,1,0)$
$4: P_{69} = (2,7,1,0)$
$5: P_{72} = (5,7,1,0)$
$6: P_{83} = (1,1,0,1)$
$7: P_{94} = (4,2,0,1)$
$8: P_{103} = (5,3,0,1)$
$9: P_{113} = (7,4,0,1)$
$10: P_{120} = (6,5,0,1)$
$11: P_{125} = (3,6,0,1)$
$12: P_{132} = (2,7,0,1)$
$13: P_{139} = (1,0,1,1)$
$14: P_{146} = (0,1,1,1)$
$15: P_{157} = (4,2,1,1)$
$16: P_{160} = (7,2,1,1)$
$17: P_{171} = (2,4,1,1)$
$18: P_{176} = (7,4,1,1)$
$19: P_{195} = (2,7,1,1)$
$20: P_{197} = (4,7,1,1)$
$21: P_{207} = (6,0,2,1)$
$22: P_{233} = (0,4,2,1)$
$23: P_{235} = (2,4,2,1)$
$24: P_{246} = (5,5,2,1)$
$25: P_{247} = (6,5,2,1)$

26 : $P_{254} = (5, 6, 2, 1)$
27 : $P_{269} = (4, 0, 3, 1)$
28 : $P_{276} = (3, 1, 3, 1)$
29 : $P_{279} = (6, 1, 3, 1)$
30 : $P_{290} = (1, 3, 3, 1)$
31 : $P_{295} = (6, 3, 3, 1)$
32 : $P_{301} = (4, 4, 3, 1)$
33 : $P_{305} = (0, 5, 3, 1)$
34 : $P_{306} = (1, 5, 3, 1)$
35 : $P_{332} = (3, 0, 4, 1)$
36 : $P_{359} = (6, 3, 4, 1)$
37 : $P_{380} = (3, 6, 4, 1)$
38 : $P_{383} = (6, 6, 4, 1)$
39 : $P_{385} = (0, 7, 4, 1)$
40 : $P_{389} = (4, 7, 4, 1)$
41 : $P_{400} = (7, 0, 5, 1)$
42 : $P_{404} = (3, 1, 5, 1)$
43 : $P_{406} = (5, 1, 5, 1)$
44 : $P_{434} = (1, 5, 5, 1)$
45 : $P_{436} = (3, 5, 5, 1)$
46 : $P_{441} = (0, 6, 5, 1)$
47 : $P_{442} = (1, 6, 5, 1)$
48 : $P_{456} = (7, 7, 5, 1)$
49 : $P_{459} = (2, 0, 6, 1)$
50 : $P_{470} = (5, 1, 6, 1)$
51 : $P_{471} = (6, 1, 6, 1)$
52 : $P_{475} = (2, 2, 6, 1)$
53 : $P_{481} = (0, 3, 6, 1)$
54 : $P_{482} = (1, 3, 6, 1)$
55 : $P_{506} = (1, 6, 6, 1)$
56 : $P_{510} = (5, 6, 6, 1)$
57 : $P_{526} = (5, 0, 7, 1)$
58 : $P_{537} = (0, 2, 7, 1)$
59 : $P_{544} = (7, 2, 7, 1)$
60 : $P_{548} = (3, 3, 7, 1)$
61 : $P_{550} = (5, 3, 7, 1)$
62 : $P_{564} = (3, 5, 7, 1)$

Line Intersection Graph

	0	1
0	0	0
1	0	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line
in point

Line 1 intersects

Line
in point

The surface has 81 points:
The points on the surface are:

0 : $P_0 = (1, 0, 0, 0)$
1 : $P_1 = (0, 1, 0, 0)$
2 : $P_2 = (0, 0, 1, 0)$
3 : $P_3 = (0, 0, 0, 1)$
4 : $P_5 = (1, 1, 0, 0)$
5 : $P_6 = (2, 1, 0, 0)$
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16 : $P_{72} = (5, 7, 1, 0)$
17 : $P_{83} = (1, 1, 0, 1)$
18 : $P_{94} = (4, 2, 0, 1)$
19 : $P_{103} = (5, 3, 0, 1)$
20 : $P_{113} = (7, 4, 0, 1)$
21 : $P_{120} = (6, 5, 0, 1)$
22 : $P_{125} = (3, 6, 0, 1)$
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