Rank-66764 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

$$X_0^3 + X_3^3 + X_0^2X_3 + X_0X_1^2 + X_0X_2^2 + X_0X_1X_2 = 0$$

(1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(8) is -1991732146

General information

Number of lines	1
Number of points	57
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	48
Number of Hesse planes	0
Number of axes	0
Type of points on lines	9
Type of lines on points	1^9, 0^{48}

Singular Points

The surface has 0 singular points:

The 1 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{4672} = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}_{4672} = \mathbf{Pl}(0,0,0,0,0,1)_{649}$$

Rank of lines: (4672)
Rank of points on Klein quadric: (649)

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:

$0: P_1 = (0,1,0,0)$ lies on line ℓ_0
$1: P_2 = (0,0,1,0)$ lies on line ℓ_0
$2: P_{19} = (0,1,1,0)$ lies on line ℓ_0
$3: P_{27} = (0,2,1,0)$ lies on line ℓ_0
$4: P_{35} = (0,3,1,0)$ lies on line ℓ_0
$5: P_{43} = (0,4,1,0)$ lies on line ℓ_0
$6: P_{51} = (0,5,1,0)$ lies on line ℓ_0
$7: P_{59} = (0,6,1,0)$ lies on line ℓ_0
$8: P_{67} = (0,7,1,0)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 48 points not on any line:
The points on the surface but not on lines are:

$0: P_4 = (1,1,1,1)$
$1: P_5 = (1,1,0,0)$
$2: P_{12} = (1,0,1,0)$
$3: P_{20} = (1,1,1,0)$
$4: P_{31} = (4,2,1,0)$
$5: P_{39} = (4,3,1,0)$
$6: P_{50} = (7,4,1,0)$
$7: P_{58} = (7,5,1,0)$
$8: P_{61} = (2,6,1,0)$
$9: P_{69} = (2,7,1,0)$
$10: P_{76} = (2,0,0,1)$
$11: P_{78} = (4,0,0,1)$
$12: P_{81} = (7,0,0,1)$
$13: P_{83} = (1,1,0,1)$
$14: P_{95} = (5,2,0,1)$
$15: P_{112} = (6,4,0,1)$
$16: P_{133} = (3,7,0,1)$
$17: P_{139} = (1,0,1,1)$
$18: P_{159} = (6,2,1,1)$
$19: P_{167} = (6,3,1,1)$
$20: P_{172} = (3,4,1,1)$
$21: P_{180} = (3,5,1,1)$
$22: P_{190} = (5,6,1,1)$
$23: P_{198} = (5,7,1,1)$
$24: P_{206} = (5,0,2,1)$
$25: P_{215} = (6,1,2,1)$
$26: P_{222} = (5,2,2,1)$
$27: P_{231} = (6,3,2,1)$
$28: P_{279} = (6,1,3,1)$
$29: P_{287} = (6,2,3,1)$
$30: P_{306} = (1,5,3,1)$
$31: P_{314} = (1,6,3,1)$
$32: P_{335} = (6,0,4,1)$
$33: P_{340} = (3,1,4,1)$
$34: P_{367} = (6,4,4,1)$
$35: P_{372} = (3,5,4,1)$
$36: P_{404} = (3,1,5,1)$
$37: P_{418} = (1,3,5,1)$
$38: P_{428} = (3,4,5,1)$
$39: P_{442} = (1,6,5,1)$
$40: P_{470} = (5,1,6,1)$
$41: P_{482} = (1,3,6,1)$
$42: P_{498} = (1,5,6,1)$
$43: P_{518} = (5,7,6,1)$

44 : $P_{524} = (3, 0, 7, 1)$
45 : $P_{534} = (5, 1, 7, 1)$
46 : $P_{574} = (5, 6, 7, 1)$
47 : $P_{580} = (3, 7, 7, 1)$

Line Intersection Graph

	0
0	0

Neighbor sets in the line intersection graph:
Line 0 intersects

Line
in point

The surface has 57 points:
The points on the surface are:

0 : $P_{1} = (0, 1, 0, 0)$
1 : $P_{2} = (0, 0, 1, 0)$
2 : $P_{4} = (1, 1, 1, 1)$
3 : $P_{5} = (1, 1, 0, 0)$
4 : $P_{12} = (1, 0, 1, 0)$
5 : $P_{19} = (0, 1, 1, 0)$
6 : $P_{20} = (1, 1, 1, 0)$
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23 : $P_{95} = (5, 2, 0, 1)$
24 : $P_{112} = (6, 4, 0, 1)$
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56 : $P_{580} = (3, 7, 7, 1)$