Rank-487 over GF(8)

January 15, 2021

The equation

The equation of the surface is :

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

(0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)
The point rank of the equation over GF(8) is 4760725

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:

$$\ell_0 = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{138} = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}_{138} = \mathbf{Pl}(0,0,1,1,1,1)_{1322}$$

Rank of lines: (138)
Rank of points on Klein quadric: (1322)

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 : $P_5 = (1, 1, 0, 0)$ lies on line ℓ_0

2 : $P_{138} = (0, 0, 1, 1)$ lies on line ℓ_0

3 : $P_{155} = (2, 2, 1, 1)$ lies on line ℓ_0

4 : $P_{164} = (3, 3, 1, 1)$ lies on line ℓ_0

5 : $P_{173} = (4, 4, 1, 1)$ lies on line ℓ_0

6 : $P_{182} = (5, 5, 1, 1)$ lies on line ℓ_0

7 : $P_{191} = (6, 6, 1, 1)$ lies on line ℓ_0

8 : $P_{200} = (7, 7, 1, 1)$ 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 : $P_0 = (1, 0, 0, 0)$

1 : $P_1 = (0, 1, 0, 0)$

2 : $P_{19} = (0, 1, 1, 0)$

3 : $P_{20} = (1, 1, 1, 0)$

4 : $P_{75} = (1, 0, 0, 1)$

5 : $P_{83} = (1, 1, 0, 1)$

6 : $P_{158} = (5, 2, 1, 1)$

7 : $P_{168} = (7, 3, 1, 1)$

8 : $P_{175} = (6, 4, 1, 1)$

9 : $P_{179} = (2, 5, 1, 1)$

10 : $P_{189} = (4, 6, 1, 1)$

11 : $P_{196} = (3, 7, 1, 1)$

12 : $P_{203} = (2, 0, 2, 1)$

13 : $P_{215} = (6, 1, 2, 1)$

14 : $P_{237} = (4, 4, 2, 1)$

15 : $P_{239} = (6, 4, 2, 1)$

16 : $P_{257} = (0, 7, 2, 1)$

17 : $P_{261} = (4, 7, 2, 1)$

18 : $P_{271} = (6, 0, 3, 1)$

19 : $P_{273} = (0, 1, 3, 1)$

20 : $P_{301} = (4, 4, 3, 1)$

21 : $P_{303} = (6, 4, 3, 1)$

22 : $P_{308} = (3, 5, 3, 1)$

23 : $P_{309} = (4, 5, 3, 1)$

24 : $P_{333} = (4, 0, 4, 1)$

25 : $P_{340} = (3, 1, 4, 1)$

26 : $P_{345} = (0, 2, 4, 1)$

27 : $P_{352} = (7, 2, 4, 1)$

28 : $P_{388} = (3, 7, 4, 1)$

29 : $P_{392} = (7, 7, 4, 1)$

30 : $P_{396} = (3, 0, 5, 1)$

31 : $P_{401} = (0, 1, 5, 1)$

32 : $P_{446} = (5, 6, 5, 1)$

33 : $P_{448} = (7, 6, 5, 1)$

34 : $P_{452} = (3, 7, 5, 1)$

35 : $P_{456} = (7, 7, 5, 1)$

36 : $P_{462} = (5, 0, 6, 1)$

37 : $P_{465} = (0, 1, 6, 1)$

38 : $P_{475} = (2, 2, 6, 1)$

39 : $P_{478} = (5, 2, 6, 1)$

40 : $P_{483} = (2, 3, 6, 1)$

41 : $P_{487} = (6, 3, 6, 1)$

42 : $P_{528} = (7, 0, 7, 1)$

43 : $P_{534} = (5, 1, 7, 1)$

$44 : P_{539} = (2, 2, 7, 1)$
$45 : P_{542} = (5, 2, 7, 1)$
$46 : P_{553} = (0, 4, 7, 1)$

$47 : P_{555} = (2, 4, 7, 1)$

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:

$0 : P_0 = (1, 0, 0, 0)$
$1 : P_1 = (0, 1, 0, 0)$
$2 : P_4 = (1, 1, 1, 1)$
$3 : P_5 = (1, 1, 0, 0)$
$4 : P_{19} = (0, 1, 1, 0)$
$5 : P_{20} = (1, 1, 1, 0)$
$6 : P_{75} = (1, 0, 0, 1)$
$7 : P_{83} = (1, 1, 0, 1)$
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$54 : P_{542} = (5, 2, 7, 1)$
$55 : P_{553} = (0, 4, 7, 1)$
$56 : P_{555} = (2, 4, 7, 1)$