Rank-65634 over GF(64)

January 15, 2021

The equation

The equation of the surface is :

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

(1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0)
The point rank of the equation over GF(64) is 1107828870

General information

Number of lines	2
Number of points	4225
Number of singular points	0
Number of Eckardt points	0
Number of double points	0
Number of single points	130
Number of points off lines	4095
Number of Hesse planes	0
Number of axes	0
Type of points on lines	65^2
Type of lines on points	1^{130}, 0^{4095}

Singular Points

The surface has 0 singular points:

The 2 Lines

The lines and their Pluecker coordinates are:

$$\ell_0 = \left[\begin{array}{cccc} 1 & 0 & \epsilon^{21} & 0 \\ 0 & 1 & 0 & \epsilon^{42} \end{array}\right]_{240761} = \left[\begin{array}{cccc} 1 & 0 & 57 & 0 \\ 0 & 1 & 0 & 56 \end{array}\right]_{240761} = \mathbf{Pl}(57, 56, 0, 0, 57, 1)_{15213113}$$

$$\ell_1 = \left[\begin{array}{cccc} 1 & 0 & \epsilon^{42} & 0 \\ 0 & 1 & 0 & \epsilon^{21} \end{array}\right]_{236664} = \left[\begin{array}{cccc} 1 & 0 & 56 & 0 \\ 0 & 1 & 0 & 57 \end{array}\right]_{236664} = \mathbf{Pl}(56, 57, 0, 0, 56, 1)_{14951032}$$

Rank of lines: (240761, 236664)
Rank of points on Klein quadric: (15213113, 14951032)

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

0 : $P_{123} = (56, 0, 1, 0)$ lies on line ℓ_0
1 : $P_{124} = (57, 0, 1, 0)$ lies on line ℓ_1
2 : $P_{7746} = (0, 56, 0, 1)$ lies on line ℓ_1
3 : $P_{7810} = (0, 57, 0, 1)$ lies on line ℓ_0
4 : $P_{11898} = (57, 56, 1, 1)$ lies on line ℓ_1
5 : $P_{11961} = (56, 57, 1, 1)$ lies on line ℓ_0
6 : $P_{15956} = (19, 56, 2, 1)$ lies on line ℓ_1
7 : $P_{16018} = (17, 57, 2, 1)$ lies on line ℓ_0
8 : $P_{20075} = (42, 56, 3, 1)$ lies on line ℓ_1
9 : $P_{20138} = (41, 57, 3, 1)$ lies on line ℓ_0
10 : $P_{24167} = (38, 56, 4, 1)$ lies on line ℓ_1
11 : $P_{24227} = (34, 57, 4, 1)$ lies on line ℓ_0
12 : $P_{28256} = (31, 56, 5, 1)$ lies on line ℓ_1
13 : $P_{28315} = (26, 57, 5, 1)$ lies on line ℓ_0
14 : $P_{32374} = (53, 56, 6, 1)$ lies on line ℓ_1
15 : $P_{32436} = (51, 57, 6, 1)$ lies on line ℓ_0
16 : $P_{36429} = (12, 56, 7, 1)$ lies on line ℓ_1
17 : $P_{36492} = (11, 57, 7, 1)$ lies on line ℓ_0
18 : $P_{40558} = (45, 56, 8, 1)$ lies on line ℓ_1
19 : $P_{40614} = (37, 57, 8, 1)$ lies on line ℓ_0
20 : $P_{44629} = (20, 56, 9, 1)$ lies on line ℓ_1
21 : $P_{44702} = (29, 57, 9, 1)$ lies on line ℓ_0
22 : $P_{48767} = (62, 56, 10, 1)$ lies on line ℓ_1
23 : $P_{48821} = (52, 57, 10, 1)$ lies on line ℓ_0
24 : $P_{52808} = (7, 56, 11, 1)$ lies on line ℓ_1
25 : $P_{52877} = (12, 57, 11, 1)$ lies on line ℓ_0
26 : $P_{56908} = (11, 56, 12, 1)$ lies on line ℓ_1
27 : $P_{56968} = (7, 57, 12, 1)$ lies on line ℓ_0
28 : $P_{61043} = (50, 56, 13, 1)$ lies on line ℓ_1
29 : $P_{61120} = (63, 57, 13, 1)$ lies on line ℓ_0
30 : $P_{65113} = (24, 56, 14, 1)$ lies on line ℓ_1
31 : $P_{65175} = (22, 57, 14, 1)$ lies on line ℓ_0
32 : $P_{69218} = (33, 56, 15, 1)$ lies on line ℓ_1
33 : $P_{69295} = (46, 57, 15, 1)$ lies on line ℓ_0
34 : $P_{73340} = (59, 56, 16, 1)$ lies on line ℓ_1
35 : $P_{73388} = (43, 57, 16, 1)$ lies on line ℓ_0
36 : $P_{77379} = (2, 56, 17, 1)$ lies on line ℓ_1
37 : $P_{77460} = (19, 57, 17, 1)$ lies on line ℓ_0
38 : $P_{81513} = (40, 56, 18, 1)$ lies on line ℓ_1
39 : $P_{81595} = (58, 57, 18, 1)$ lies on line ℓ_0
40 : $P_{85586} = (17, 56, 19, 1)$ lies on line ℓ_1
41 : $P_{85635} = (2, 57, 19, 1)$ lies on line ℓ_0
42 : $P_{89694} = (29, 56, 20, 1)$ lies on line ℓ_1
43 : $P_{89738} = (9, 57, 20, 1)$ lies on line ℓ_0
44 : $P_{93797} = (36, 56, 21, 1)$ lies on line ℓ_1
45 : $P_{93874} = (49, 57, 21, 1)$ lies on line ℓ_0
46 : $P_{97871} = (14, 56, 22, 1)$ lies on line ℓ_1
47 : $P_{97945} = (24, 57, 22, 1)$ lies on line ℓ_0
48 : $P_{102008} = (55, 56, 23, 1)$ lies on line ℓ_1
49 : $P_{102049} = (32, 57, 23, 1)$ lies on line ℓ_0
50 : $P_{106071} = (22, 56, 24, 1)$ lies on line ℓ_1
51 : $P_{106127} = (14, 57, 24, 1)$ lies on line ℓ_0
52 : $P_{110192} = (47, 56, 25, 1)$ lies on line ℓ_1
53 : $P_{110263} = (54, 57, 25, 1)$ lies on line ℓ_0
54 : $P_{114246} = (5, 56, 26, 1)$ lies on line ℓ_1
55 : $P_{114336} = (31, 57, 26, 1)$ lies on line ℓ_0
56 : $P_{118397} = (60, 56, 27, 1)$ lies on line ℓ_1
57 : $P_{118440} = (39, 57, 27, 1)$ lies on line ℓ_0
58 : $P_{122481} = (48, 56, 28, 1)$ lies on line ℓ_1
59 : $P_{122541} = (44, 57, 28, 1)$ lies on line ℓ_0
60 : $P_{126538} = (9, 56, 29, 1)$ lies on line ℓ_1
61 : $P_{126613} = (20, 57, 29, 1)$ lies on line ℓ_0
62 : $P_{130660} = (35, 56, 30, 1)$ lies on line ℓ_1
63 : $P_{130750} = (61, 57, 30, 1)$ lies on line ℓ_0
64 : $P_{134747} = (26, 56, 31, 1)$ lies on line ℓ_1
65 : $P_{134790} = (5, 57, 31, 1)$ lies on line ℓ_0

66 : $P_{138840} = (23, 56, 32, 1)$ lies on line ℓ_1
67 : $P_{138936} = (55, 57, 32, 1)$ lies on line ℓ_0
68 : $P_{142959} = (46, 56, 33, 1)$ lies on line ℓ_1
69 : $P_{142992} = (15, 57, 33, 1)$ lies on line ℓ_0
70 : $P_{147013} = (4, 56, 34, 1)$ lies on line ℓ_1
71 : $P_{147111} = (38, 57, 34, 1)$ lies on line ℓ_0
72 : $P_{151166} = (61, 56, 35, 1)$ lies on line ℓ_1
73 : $P_{151199} = (30, 57, 35, 1)$ lies on line ℓ_0
74 : $P_{155250} = (49, 56, 36, 1)$ lies on line ℓ_1
75 : $P_{155286} = (21, 57, 36, 1)$ lies on line ℓ_0
76 : $P_{159305} = (8, 56, 37, 1)$ lies on line ℓ_1
77 : $P_{159406} = (45, 57, 37, 1)$ lies on line ℓ_0
78 : $P_{163427} = (34, 56, 38, 1)$ lies on line ℓ_1
79 : $P_{163461} = (4, 57, 38, 1)$ lies on line ℓ_0
80 : $P_{167516} = (27, 56, 39, 1)$ lies on line ℓ_1
81 : $P_{167613} = (60, 57, 39, 1)$ lies on line ℓ_0
82 : $P_{171643} = (58, 56, 40, 1)$ lies on line ℓ_1
83 : $P_{171667} = (18, 57, 40, 1)$ lies on line ℓ_0
84 : $P_{175684} = (3, 56, 41, 1)$ lies on line ℓ_1
85 : $P_{175787} = (42, 57, 41, 1)$ lies on line ℓ_0
86 : $P_{179818} = (41, 56, 42, 1)$ lies on line ℓ_1
87 : $P_{179844} = (3, 57, 42, 1)$ lies on line ℓ_0
88 : $P_{183889} = (16, 56, 43, 1)$ lies on line ℓ_1
89 : $P_{183996} = (59, 57, 43, 1)$ lies on line ℓ_0
90 : $P_{187997} = (28, 56, 44, 1)$ lies on line ℓ_1
91 : $P_{188081} = (48, 57, 44, 1)$ lies on line ℓ_0
92 : $P_{192102} = (37, 56, 45, 1)$ lies on line ℓ_1
93 : $P_{192137} = (8, 57, 45, 1)$ lies on line ℓ_0
94 : $P_{196176} = (15, 56, 46, 1)$ lies on line ℓ_1
95 : $P_{196258} = (33, 57, 46, 1)$ lies on line ℓ_0
96 : $P_{200311} = (54, 56, 47, 1)$ lies on line ℓ_1
97 : $P_{200346} = (25, 57, 47, 1)$ lies on line ℓ_0
98 : $P_{204397} = (44, 56, 48, 1)$ lies on line ℓ_1
99 : $P_{204445} = (28, 57, 48, 1)$ lies on line ℓ_0
100 : $P_{208470} = (21, 56, 49, 1)$ lies on line ℓ_1
101 : $P_{208549} = (36, 57, 49, 1)$ lies on line ℓ_0
102 : $P_{212608} = (63, 56, 50, 1)$ lies on line ℓ_1
103 : $P_{212622} = (13, 57, 50, 1)$ lies on line ℓ_0
104 : $P_{216647} = (6, 56, 51, 1)$ lies on line ℓ_1
105 : $P_{216758} = (53, 57, 51, 1)$ lies on line ℓ_0
106 : $P_{220747} = (10, 56, 52, 1)$ lies on line ℓ_1
107 : $P_{220863} = (62, 57, 52, 1)$ lies on line ℓ_0
108 : $P_{224884} = (51, 56, 53, 1)$ lies on line ℓ_1
109 : $P_{224903} = (6, 57, 53, 1)$ lies on line ℓ_0
110 : $P_{228954} = (25, 56, 54, 1)$ lies on line ℓ_1
111 : $P_{229040} = (47, 57, 54, 1)$ lies on line ℓ_0
112 : $P_{233057} = (32, 56, 55, 1)$ lies on line ℓ_1
113 : $P_{233112} = (23, 57, 55, 1)$ lies on line ℓ_0
114 : $P_{237122} = (1, 56, 56, 1)$ lies on line ℓ_1
115 : $P_{237242} = (57, 57, 56, 1)$ lies on line ℓ_0
116 : $P_{241273} = (56, 56, 57, 1)$ lies on line ℓ_1
117 : $P_{241282} = (1, 57, 57, 1)$ lies on line ℓ_0
118 : $P_{245331} = (18, 56, 58, 1)$ lies on line ℓ_1
119 : $P_{245417} = (40, 57, 58, 1)$ lies on line ℓ_0
120 : $P_{249452} = (43, 56, 59, 1)$ lies on line ℓ_1
121 : $P_{249489} = (16, 57, 59, 1)$ lies on line ℓ_0
122 : $P_{253544} = (39, 56, 60, 1)$ lies on line ℓ_1
123 : $P_{253596} = (27, 57, 60, 1)$ lies on line ℓ_0
124 : $P_{257631} = (30, 56, 61, 1)$ lies on line ℓ_1
125 : $P_{257700} = (35, 57, 61, 1)$ lies on line ℓ_0
126 : $P_{261749} = (52, 56, 62, 1)$ lies on line ℓ_1
127 : $P_{261771} = (10, 57, 62, 1)$ lies on line ℓ_0
128 : $P_{265806} = (13, 56, 63, 1)$ lies on line ℓ_1
129 : $P_{265907} = (50, 57, 63, 1)$ lies on line ℓ_0

The single points on the surface are:

Points on surface but on no line

The surface has 4095 points not on any line:
Too many to print.

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 4225 points:
Too many to print.