Rank-362 over GF(64)

January 15, 2021

The equation

The equation of the surface is :

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

(1, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0)
The point rank of the equation over GF(64) is 1107828878

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:

$$\ell_0 = \begin{bmatrix} 1 & 0 & \epsilon^{21} & 0 \\ 0 & 1 & 1 & \epsilon^{21} \end{bmatrix}_{240826} = \begin{bmatrix} 1 & 0 & 57 & 0 \\ 0 & 1 & 1 & 57 \end{bmatrix}_{240826} = \mathbf{Pl}(56, 57, 56, 0, 1, 1)_{540160}$$

$$\ell_1 = \begin{bmatrix} 1 & 0 & \epsilon^{42} & 0 \\ 0 & 1 & 1 & \epsilon^{42} \end{bmatrix}_{236601} = \begin{bmatrix} 1 & 0 & 56 & 0 \\ 0 & 1 & 1 & 56 \end{bmatrix}_{236601} = \mathbf{Pl}(57, 56, 57, 0, 1, 1)_{540224}$$

Rank of lines: (240826, 236601)
Rank of points on Klein quadric: (540160, 540224)

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 : $P_{7803} = (57, 56, 0, 1)$ lies on line ℓ_0
3 : $P_{7866} = (56, 57, 0, 1)$ lies on line ℓ_1
4 : $P_{11842} = (1, 56, 1, 1)$ lies on line ℓ_0
5 : $P_{11906} = (1, 57, 1, 1)$ lies on line ℓ_1
6 : $P_{15977} = (40, 56, 2, 1)$ lies on line ℓ_0
7 : $P_{16044} = (43, 57, 2, 1)$ lies on line ℓ_1
8 : $P_{20049} = (16, 56, 3, 1)$ lies on line ℓ_0
9 : $P_{20115} = (18, 57, 3, 1)$ lies on line ℓ_1
10 : $P_{24156} = (27, 56, 4, 1)$ lies on line ℓ_0
11 : $P_{24223} = (30, 57, 4, 1)$ lies on line ℓ_1
12 : $P_{28260} = (35, 56, 5, 1)$ lies on line ℓ_0
13 : $P_{28328} = (39, 57, 5, 1)$ lies on line ℓ_1
14 : $P_{32331} = (10, 56, 6, 1)$ lies on line ℓ_0
15 : $P_{32398} = (13, 57, 6, 1)$ lies on line ℓ_1
16 : $P_{36467} = (50, 56, 7, 1)$ lies on line ℓ_0
17 : $P_{36533} = (52, 57, 7, 1)$ lies on line ℓ_1
18 : $P_{40541} = (28, 56, 8, 1)$ lies on line ℓ_0
19 : $P_{40598} = (21, 57, 8, 1)$ lies on line ℓ_1
20 : $P_{44645} = (36, 56, 9, 1)$ lies on line ℓ_0
21 : $P_{44717} = (44, 57, 9, 1)$ lies on line ℓ_1
22 : $P_{48718} = (13, 56, 10, 1)$ lies on line ℓ_0
23 : $P_{48775} = (6, 57, 10, 1)$ lies on line ℓ_1
24 : $P_{52854} = (53, 56, 11, 1)$ lies on line ℓ_0
25 : $P_{52928} = (63, 57, 11, 1)$ lies on line ℓ_1
26 : $P_{56959} = (62, 56, 12, 1)$ lies on line ℓ_0
27 : $P_{57012} = (51, 57, 12, 1)$ lies on line ℓ_1
28 : $P_{60999} = (6, 56, 13, 1)$ lies on line ℓ_0
29 : $P_{61067} = (10, 57, 13, 1)$ lies on line ℓ_1
30 : $P_{65136} = (47, 56, 14, 1)$ lies on line ℓ_0
31 : $P_{65185} = (32, 57, 14, 1)$ lies on line ℓ_1
32 : $P_{69208} = (23, 56, 15, 1)$ lies on line ℓ_0
33 : $P_{69274} = (25, 57, 15, 1)$ lies on line ℓ_1
34 : $P_{73299} = (18, 56, 16, 1)$ lies on line ℓ_0
35 : $P_{73348} = (3, 57, 16, 1)$ lies on line ℓ_1
36 : $P_{77419} = (42, 56, 17, 1)$ lies on line ℓ_0
37 : $P_{77499} = (58, 57, 17, 1)$ lies on line ℓ_1
38 : $P_{81476} = (3, 56, 18, 1)$ lies on line ℓ_0
39 : $P_{81553} = (16, 57, 18, 1)$ lies on line ℓ_1
40 : $P_{85628} = (59, 56, 19, 1)$ lies on line ℓ_0
41 : $P_{85674} = (41, 57, 19, 1)$ lies on line ℓ_1
42 : $P_{89713} = (48, 56, 20, 1)$ lies on line ℓ_0
43 : $P_{89766} = (37, 57, 20, 1)$ lies on line ℓ_1
44 : $P_{93769} = (8, 56, 21, 1)$ lies on line ℓ_0
45 : $P_{93853} = (28, 57, 21, 1)$ lies on line ℓ_1
46 : $P_{97890} = (33, 56, 22, 1)$ lies on line ℓ_0
47 : $P_{97975} = (54, 57, 22, 1)$ lies on line ℓ_1
48 : $P_{101978} = (25, 56, 23, 1)$ lies on line ℓ_0
49 : $P_{102032} = (15, 57, 23, 1)$ lies on line ℓ_1
50 : $P_{106104} = (55, 56, 24, 1)$ lies on line ℓ_0
51 : $P_{106159} = (46, 57, 24, 1)$ lies on line ℓ_1
52 : $P_{110160} = (15, 56, 25, 1)$ lies on line ℓ_0
53 : $P_{110232} = (23, 57, 25, 1)$ lies on line ℓ_1
54 : $P_{114279} = (38, 56, 26, 1)$ lies on line ℓ_0
55 : $P_{114366} = (61, 57, 26, 1)$ lies on line ℓ_1
56 : $P_{118367} = (30, 56, 27, 1)$ lies on line ℓ_0
57 : $P_{118405} = (4, 57, 27, 1)$ lies on line ℓ_1
58 : $P_{122454} = (21, 56, 28, 1)$ lies on line ℓ_0
59 : $P_{122505} = (8, 57, 28, 1)$ lies on line ℓ_1
60 : $P_{126574} = (45, 56, 29, 1)$ lies on line ℓ_0
61 : $P_{126642} = (49, 57, 29, 1)$ lies on line ℓ_1
62 : $P_{130629} = (4, 56, 30, 1)$ lies on line ℓ_0
63 : $P_{130716} = (27, 57, 30, 1)$ lies on line ℓ_1
64 : $P_{134781} = (60, 56, 31, 1)$ lies on line ℓ_0
65 : $P_{134819} = (34, 57, 31, 1)$ lies on line ℓ_1

66 : $P_{138831} = (14, 56, 32, 1)$ lies on line ℓ_0
67 : $P_{138928} = (47, 57, 32, 1)$ lies on line ℓ_1
68 : $P_{142967} = (54, 56, 33, 1)$ lies on line ℓ_0
69 : $P_{142999} = (22, 57, 33, 1)$ lies on line ℓ_1
70 : $P_{147040} = (31, 56, 34, 1)$ lies on line ℓ_0
71 : $P_{147133} = (60, 57, 34, 1)$ lies on line ℓ_1
72 : $P_{151144} = (39, 56, 35, 1)$ lies on line ℓ_0
73 : $P_{151174} = (5, 57, 35, 1)$ lies on line ℓ_1
74 : $P_{155245} = (44, 56, 36, 1)$ lies on line ℓ_0
75 : $P_{155274} = (9, 57, 36, 1)$ lies on line ℓ_1
76 : $P_{159317} = (20, 56, 37, 1)$ lies on line ℓ_0
77 : $P_{159409} = (48, 57, 37, 1)$ lies on line ℓ_1
78 : $P_{163454} = (61, 56, 38, 1)$ lies on line ℓ_0
79 : $P_{163483} = (26, 57, 38, 1)$ lies on line ℓ_1
80 : $P_{167494} = (5, 56, 39, 1)$ lies on line ℓ_0
81 : $P_{167588} = (35, 57, 39, 1)$ lies on line ℓ_1
82 : $P_{171628} = (43, 56, 40, 1)$ lies on line ℓ_0
83 : $P_{171651} = (2, 57, 40, 1)$ lies on line ℓ_1
84 : $P_{175700} = (19, 56, 41, 1)$ lies on line ℓ_0
85 : $P_{175804} = (59, 57, 41, 1)$ lies on line ℓ_1
86 : $P_{179835} = (58, 56, 42, 1)$ lies on line ℓ_0
87 : $P_{179858} = (17, 57, 42, 1)$ lies on line ℓ_1
88 : $P_{183875} = (2, 56, 43, 1)$ lies on line ℓ_0
89 : $P_{183977} = (40, 57, 43, 1)$ lies on line ℓ_1
90 : $P_{187978} = (9, 56, 44, 1)$ lies on line ℓ_0
91 : $P_{188069} = (36, 57, 44, 1)$ lies on line ℓ_1
92 : $P_{192114} = (49, 56, 45, 1)$ lies on line ℓ_0
93 : $P_{192158} = (29, 57, 45, 1)$ lies on line ℓ_1
94 : $P_{196185} = (24, 56, 46, 1)$ lies on line ℓ_0
95 : $P_{196280} = (55, 57, 46, 1)$ lies on line ℓ_1
96 : $P_{200289} = (32, 56, 47, 1)$ lies on line ℓ_0
97 : $P_{200335} = (14, 57, 47, 1)$ lies on line ℓ_1
98 : $P_{204390} = (37, 56, 48, 1)$ lies on line ℓ_0
99 : $P_{204437} = (20, 57, 48, 1)$ lies on line ℓ_1
100 : $P_{208478} = (29, 56, 49, 1)$ lies on line ℓ_0
101 : $P_{208558} = (45, 57, 49, 1)$ lies on line ℓ_1
102 : $P_{212597} = (52, 56, 50, 1)$ lies on line ℓ_0
103 : $P_{212616} = (7, 57, 50, 1)$ lies on line ℓ_1
104 : $P_{216653} = (12, 56, 51, 1)$ lies on line ℓ_0
105 : $P_{216767} = (62, 57, 51, 1)$ lies on line ℓ_1
106 : $P_{220744} = (7, 56, 52, 1)$ lies on line ℓ_0
107 : $P_{220851} = (50, 57, 52, 1)$ lies on line ℓ_1
108 : $P_{224896} = (63, 56, 53, 1)$ lies on line ℓ_0
109 : $P_{224908} = (11, 57, 53, 1)$ lies on line ℓ_1
110 : $P_{228951} = (22, 56, 54, 1)$ lies on line ℓ_0
111 : $P_{229026} = (33, 57, 54, 1)$ lies on line ℓ_1
112 : $P_{233071} = (46, 56, 55, 1)$ lies on line ℓ_0
113 : $P_{233113} = (24, 57, 55, 1)$ lies on line ℓ_1
114 : $P_{237121} = (0, 56, 56, 1)$ lies on line ℓ_0
115 : $P_{237242} = (57, 57, 56, 1)$ lies on line ℓ_1
116 : $P_{241273} = (56, 56, 57, 1)$ lies on line ℓ_0
117 : $P_{241281} = (0, 57, 57, 1)$ lies on line ℓ_1
118 : $P_{245330} = (17, 56, 58, 1)$ lies on line ℓ_0
119 : $P_{245419} = (42, 57, 58, 1)$ lies on line ℓ_1
120 : $P_{249450} = (41, 56, 59, 1)$ lies on line ℓ_0
121 : $P_{249492} = (19, 57, 59, 1)$ lies on line ℓ_1
122 : $P_{253539} = (34, 56, 60, 1)$ lies on line ℓ_0
123 : $P_{253600} = (31, 57, 60, 1)$ lies on line ℓ_1
124 : $P_{257627} = (26, 56, 61, 1)$ lies on line ℓ_0
125 : $P_{257703} = (38, 57, 61, 1)$ lies on line ℓ_1
126 : $P_{261748} = (51, 56, 62, 1)$ lies on line ℓ_0
127 : $P_{261773} = (12, 57, 62, 1)$ lies on line ℓ_1
128 : $P_{265804} = (11, 56, 63, 1)$ lies on line ℓ_0
129 : $P_{265910} = (53, 57, 63, 1)$ lies on line ℓ_1

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.