

1 BLT set 4 over GF(25)

Points on the quadric $x_0^2 + x_1x_2 + x_3x_4$:

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

$$P_2 = (0, 0, 1, 0, 0)$$

$$P_3 = (0, 1, 17, 4, 17)$$

$$P_4 = (0, 1, 13, 2, 21)$$

$$P_5 = (0, 1, 21, 12, 20)$$

$$P_6 = (1, 21, 19, 21, 21)$$

$$P_7 = (1, 19, 16, 10, 15)$$

$$P_8 = (1, 3, 14, 5, 20)$$

$$P_9 = (1, 12, 10, 13, 21)$$

$$P_{10} = (1, 1, 16, 19, 23)$$

$$P_{11} = (1, 6, 7, 7, 8)$$

$$P_{12} = (1, 14, 19, 8, 17)$$

$$P_{13} = (1, 24, 13, 5, 6)$$

$$P_{14} = (1, 3, 15, 11, 16)$$

$$P_{15} = (1, 11, 13, 3, 8)$$

$$P_{16} = (1, 12, 15, 4, 14)$$

$$P_{17} = (1, 3, 7, 19, 23)$$

$$P_{18} = (1, 18, 14, 7, 8)$$

$$P_{19} = (1, 15, 8, 6, 14)$$

$$P_{20} = (1, 5, 8, 13, 13)$$

$$P_{21} = (1, 1, 5, 20, 14)$$

$$P_{22} = (1, 5, 22, 9, 14)$$

$$P_{23} = (1, 20, 11, 6, 14)$$

$$P_{24} = (1, 24, 13, 10, 18)$$

$$P_{25} = (1, 14, 1, 7, 12)$$

$$P_{26} = (1, 8, 9, 23, 3)$$

Stabilizer of order 8 is generated by:

$$g_1 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}, 1$$

with 6 fixed points

$$g_2 = \begin{pmatrix} 16 & 20 & 5 & 22 & 11 \\ 15 & 14 & 4 & 6 & 20 \\ 10 & 11 & 14 & 1 & 12 \\ 8 & 12 & 20 & 21 & 18 \\ 11 & 1 & 6 & 9 & 21 \end{pmatrix}, 0$$

with 26 fixed points The induced group has order 8 and is generated by:

$$g_1 = (9)(21)(3, 19, 12, 13)(5, 6, 11, 17)(8, 15, 18, 14)(4, 25, 20, 7)(2, 24, 26, 10)(1, 16, 22, 23)$$

$$g_2 = (2, 22)(3, 5)(4, 8)(6, 19)(7, 14)(9, 21)(10, 16)(11, 12)(13, 17)(15, 25)(18, 20)(23, 24)(1, 26)$$

group order is small, so we list all elements

$$a_1 = (2)(3)(4)(5)(6)(7)(8)(9)(10)(11)(12)(13)(14)(15)(16)(17)(18)(19)(20)(21)(22)(23)(24)(25)(26)(1)$$

$$a_2 = (9)(21)(3, 19, 12, 13)(5, 6, 11, 17)(8, 15, 18, 14)(4, 25, 20, 7)(2, 24, 26, 10)(1, 16, 22, 23)$$

$$a_3 = (21)(9)(3, 12)(5, 11)(6, 17)(7, 25)(8, 18)(4, 20)(10, 24)(13, 19)(14, 15)(16, 23)(2, 26)(1, 22)$$

$$a_4 = (9)(21)(3, 13, 12, 19)(5, 17, 11, 6)(8, 14, 18, 15)(4, 7, 20, 25)(2, 10, 26, 24)(1, 23, 22, 16)$$

$$a_5 = (2, 22)(3, 5)(4, 8)(6, 19)(7, 14)(9, 21)(10, 16)(11, 12)(13, 17)(15, 25)(18, 20)(23, 24)(1, 26)$$

$$a_6 = (9, 21)(3, 6, 12, 17)(4, 15, 20, 14)(5, 19, 11, 13)(7, 8, 25, 18)(2, 23, 26, 16)(1, 10, 22, 24)$$

$$a_7 = (3, 11)(4, 18)(5, 12)(6, 13)(7, 15)(8, 20)(9, 21)(10, 23)(14, 25)(16, 24)(17, 19)(22, 26)(1, 2)$$

$$a_8 = (9, 21)(3, 17, 12, 6)(4, 14, 20, 15)(5, 13, 11, 19)(7, 18, 25, 8)(2, 16, 26, 23)(1, 24, 22, 10)$$

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$, 0 with 16276 fixed points

$a_2 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}$, 1 with 6 fixed points

$a_3 = \begin{pmatrix} 19 & 13 & 7 & 23 & 2 \\ 16 & 24 & 13 & 8 & 2 \\ 9 & 15 & 24 & 19 & 17 \\ 1 & 17 & 2 & 12 & 16 \\ 14 & 19 & 8 & 5 & 12 \end{pmatrix}$, 0 with 28 fixed points

$a_4 = \begin{pmatrix} 23 & 5 & 12 & 4 & 22 \\ 5 & 3 & 9 & 7 & 24 \\ 21 & 21 & 8 & 16 & 19 \\ 4 & 17 & 15 & 1 & 2 \\ 1 & 8 & 24 & 0 & 5 \end{pmatrix}$, 1 with 6 fixed points

$a_5 = \begin{pmatrix} 16 & 20 & 5 & 22 & 11 \\ 15 & 14 & 4 & 6 & 20 \\ 10 & 11 & 14 & 1 & 12 \\ 8 & 12 & 20 & 21 & 18 \\ 11 & 1 & 6 & 9 & 21 \end{pmatrix}$, 0 with 26 fixed points

$$a_6 = \begin{pmatrix} 19 & 3 & 17 & 16 & 8 \\ 10 & 10 & 12 & 17 & 6 \\ 13 & 18 & 7 & 20 & 11 \\ 21 & 16 & 14 & 15 & 6 \\ 22 & 1 & 4 & 17 & 16 \end{pmatrix}, 1 \text{ with 8 fixed points}$$

$$a_7 = \begin{pmatrix} 18 & 0 & 0 & 9 & 8 \\ 0 & 0 & 8 & 0 & 0 \\ 0 & 6 & 0 & 0 & 0 \\ 19 & 0 & 0 & 9 & 17 \\ 17 & 0 & 0 & 9 & 9 \end{pmatrix}, 0 \text{ with 26 fixed points}$$

$$a_8 = \begin{pmatrix} 12 & 5 & 9 & 12 & 10 \\ 5 & 23 & 19 & 4 & 16 \\ 4 & 11 & 17 & 1 & 14 \\ 12 & 18 & 22 & 14 & 22 \\ 7 & 9 & 10 & 10 & 13 \end{pmatrix}, 1 \text{ with 8 fixed points}$$

Kernel has order 1 and is generated by:

There are 4 orbits on the BLT set.

The orbit length are $[8^3, 2]$

The orbits are:

$$O_0 = \{1, 2, 10, 16, 22, 23, 24, 26\} \text{ (length 8)}$$

$$O_1 = \{3, 5, 6, 11, 12, 13, 17, 19\} \text{ (length 8)}$$

$$O_2 = \{4, 7, 8, 14, 15, 18, 20, 25\} \text{ (length 8)}$$

$$O_3 = \{9, 21\} \text{ (length 2)}$$

The actions induced on the orbits are:

Induced action on orbit $O_0 = \{1, 2, 10, 16, 22, 23, 24, 26\}$ (length 8)

The induced group has order 8 and is generated by:

$$g_1 = (2, 7, 8, 3)(1, 4, 5, 6)$$

$$g_2 = (2, 5)(3, 4)(6, 7)(1, 8)$$

group order is small, so we list all elements

$$a_1 = (2)(3)(4)(5)(6)(7)(8)(1)$$

$$a_2 = (2, 7, 8, 3)(1, 4, 5, 6)$$

$$a_3 = (2, 8)(3, 7)(4, 6)(1, 5)$$

$$a_4 = (2, 3, 8, 7)(1, 6, 5, 4)$$

$$a_5 = (2, 5)(3, 4)(6, 7)(1, 8)$$

$$a_6 = (2, 6, 8, 4)(1, 3, 5, 7)$$

$$a_7 = (3, 6)(4, 7)(5, 8)(1, 2)$$

$$a_8 = (2, 4, 8, 6)(1, 7, 5, 3)$$

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$, 0 with 26 fixed points

$$a_2 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

$$a_3 = \begin{pmatrix} 19 & 13 & 7 & 23 & 2 \\ 16 & 24 & 13 & 8 & 2 \\ 9 & 15 & 24 & 19 & 17 \\ 1 & 17 & 2 & 12 & 16 \\ 14 & 19 & 8 & 5 & 12 \end{pmatrix}, 0 \text{ with 2 fixed points}$$

$$a_4 = \begin{pmatrix} 23 & 5 & 12 & 4 & 22 \\ 5 & 3 & 9 & 7 & 24 \\ 21 & 21 & 8 & 16 & 19 \\ 4 & 17 & 15 & 1 & 2 \\ 1 & 8 & 24 & 0 & 5 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

$$a_5 = \begin{pmatrix} 16 & 20 & 5 & 22 & 11 \\ 15 & 14 & 4 & 6 & 20 \\ 10 & 11 & 14 & 1 & 12 \\ 8 & 12 & 20 & 21 & 18 \\ 11 & 1 & 6 & 9 & 21 \end{pmatrix}, 0 \text{ with 0 fixed points}$$

$$a_6 = \begin{pmatrix} 19 & 3 & 17 & 16 & 8 \\ 10 & 10 & 12 & 17 & 6 \\ 13 & 18 & 7 & 20 & 11 \\ 21 & 16 & 14 & 15 & 6 \\ 22 & 1 & 4 & 17 & 16 \end{pmatrix}, 1 \text{ with 0 fixed points}$$

$$a_7 = \begin{pmatrix} 18 & 0 & 0 & 9 & 8 \\ 0 & 0 & 8 & 0 & 0 \\ 0 & 6 & 0 & 0 & 0 \\ 19 & 0 & 0 & 9 & 17 \\ 17 & 0 & 0 & 9 & 9 \end{pmatrix}, 0 \text{ with 0 fixed points}$$

$$a_8 = \begin{pmatrix} 12 & 5 & 9 & 12 & 10 \\ 5 & 23 & 19 & 4 & 16 \\ 4 & 11 & 17 & 1 & 14 \\ 12 & 18 & 22 & 14 & 22 \\ 7 & 9 & 10 & 10 & 13 \end{pmatrix}, 1 \text{ with 0 fixed points}$$

Kernel has order 1 and is generated by:

Induced action on orbit $O_1 = \{3, 5, 6, 11, 12, 13, 17, 19\}$ (length 8)

The induced group has order 8 and is generated by:

$$g_1 = (2, 3, 4, 7)(1, 8, 5, 6)$$

$$g_2 = (3, 8)(4, 5)(6, 7)(1, 2)$$

group order is small, so we list all elements

$$a_1 = (2)(3)(4)(5)(6)(7)(8)(1)$$

$$a_2 = (2, 3, 4, 7)(1, 8, 5, 6)$$

$$a_3 = (2, 4)(3, 7)(6, 8)(1, 5)$$

$$a_4 = (2, 7, 4, 3)(1, 6, 5, 8)$$

$$a_5 = (3, 8)(4, 5)(6, 7)(1, 2)$$

$$a_6 = (2, 8, 4, 6)(1, 3, 5, 7)$$

$$a_7 = (2, 5)(3, 6)(7, 8)(1, 4)$$

$$a_8 = (2, 6, 4, 8)(1, 7, 5, 3)$$

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$, 0 with 26 fixed points

$$a_2 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

$$a_3 = \begin{pmatrix} 19 & 13 & 7 & 23 & 2 \\ 16 & 24 & 13 & 8 & 2 \\ 9 & 15 & 24 & 19 & 17 \\ 1 & 17 & 2 & 12 & 16 \\ 14 & 19 & 8 & 5 & 12 \end{pmatrix}, 0 \text{ with 2 fixed points}$$

$$a_4 = \begin{pmatrix} 23 & 5 & 12 & 4 & 22 \\ 5 & 3 & 9 & 7 & 24 \\ 21 & 21 & 8 & 16 & 19 \\ 4 & 17 & 15 & 1 & 2 \\ 1 & 8 & 24 & 0 & 5 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

$$a_5 = \begin{pmatrix} 16 & 20 & 5 & 22 & 11 \\ 15 & 14 & 4 & 6 & 20 \\ 10 & 11 & 14 & 1 & 12 \\ 8 & 12 & 20 & 21 & 18 \\ 11 & 1 & 6 & 9 & 21 \end{pmatrix}, 0 \text{ with 0 fixed points}$$

$$a_6 = \begin{pmatrix} 19 & 3 & 17 & 16 & 8 \\ 10 & 10 & 12 & 17 & 6 \\ 13 & 18 & 7 & 20 & 11 \\ 21 & 16 & 14 & 15 & 6 \\ 22 & 1 & 4 & 17 & 16 \end{pmatrix}, 1 \text{ with 0 fixed points}$$

$$a_7 = \begin{pmatrix} 18 & 0 & 0 & 9 & 8 \\ 0 & 0 & 8 & 0 & 0 \\ 0 & 6 & 0 & 0 & 0 \\ 19 & 0 & 0 & 9 & 17 \\ 17 & 0 & 0 & 9 & 9 \end{pmatrix}, 0 \text{ with 0 fixed points}$$

$$a_8 = \begin{pmatrix} 12 & 5 & 9 & 12 & 10 \\ 5 & 23 & 19 & 4 & 16 \\ 4 & 11 & 17 & 1 & 14 \\ 12 & 18 & 22 & 14 & 22 \\ 7 & 9 & 10 & 10 & 13 \end{pmatrix}, 1 \text{ with 0 fixed points}$$

Kernel has order 1 and is generated by:

Induced action on orbit $O_2 = \{4, 7, 8, 14, 15, 18, 20, 25\}$ (length 8)

The induced group has order 8 and is generated by:

$$g_1 = (3, 5, 6, 4)(1, 8, 7, 2)$$

$$g_2 = (2, 4)(5, 8)(6, 7)(1, 3)$$

group order is small, so we list all elements

$$a_1 = (2)(3)(4)(5)(6)(7)(8)(1)$$

$$a_2 = (3, 5, 6, 4)(1, 8, 7, 2)$$

$$a_3 = (2, 8)(3, 6)(4, 5)(1, 7)$$

$$a_4 = (3, 4, 6, 5)(1, 2, 7, 8)$$

$$a_5 = (2, 4)(5, 8)(6, 7)(1, 3)$$

$$a_6 = (2, 3, 8, 6)(1, 5, 7, 4)$$

$$a_7 = (2, 5)(3, 7)(4, 8)(1, 6)$$

$$a_8 = (2, 6, 8, 3)(1, 4, 7, 5)$$

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$, 0 with 26 fixed points

$$a_2 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

$$a_3 = \begin{pmatrix} 19 & 13 & 7 & 23 & 2 \\ 16 & 24 & 13 & 8 & 2 \\ 9 & 15 & 24 & 19 & 17 \\ 1 & 17 & 2 & 12 & 16 \\ 14 & 19 & 8 & 5 & 12 \end{pmatrix}, 0 \text{ with 2 fixed points}$$

$$a_4 = \begin{pmatrix} 23 & 5 & 12 & 4 & 22 \\ 5 & 3 & 9 & 7 & 24 \\ 21 & 21 & 8 & 16 & 19 \\ 4 & 17 & 15 & 1 & 2 \\ 1 & 8 & 24 & 0 & 5 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

$$a_5 = \begin{pmatrix} 16 & 20 & 5 & 22 & 11 \\ 15 & 14 & 4 & 6 & 20 \\ 10 & 11 & 14 & 1 & 12 \\ 8 & 12 & 20 & 21 & 18 \\ 11 & 1 & 6 & 9 & 21 \end{pmatrix}, 0 \text{ with 0 fixed points}$$

$$a_6 = \begin{pmatrix} 19 & 3 & 17 & 16 & 8 \\ 10 & 10 & 12 & 17 & 6 \\ 13 & 18 & 7 & 20 & 11 \\ 21 & 16 & 14 & 15 & 6 \\ 22 & 1 & 4 & 17 & 16 \end{pmatrix}, 1 \text{ with 0 fixed points}$$

$$a_7 = \begin{pmatrix} 18 & 0 & 0 & 9 & 8 \\ 0 & 0 & 8 & 0 & 0 \\ 0 & 6 & 0 & 0 & 0 \\ 19 & 0 & 0 & 9 & 17 \\ 17 & 0 & 0 & 9 & 9 \end{pmatrix}, 0 \text{ with 0 fixed points}$$

$$a_8 = \begin{pmatrix} 12 & 5 & 9 & 12 & 10 \\ 5 & 23 & 19 & 4 & 16 \\ 4 & 11 & 17 & 1 & 14 \\ 12 & 18 & 22 & 14 & 22 \\ 7 & 9 & 10 & 10 & 13 \end{pmatrix}, 1 \text{ with 0 fixed points}$$

Kernel has order 1 and is generated by:

Induced action on orbit $O_3 = \{9, 21\}$ (length 2)

The induced group has order 2 and is generated by:

$$g_1 = (2)(1)$$

$$g_2 = (1, 2)$$

group order is small, so we list all elements

$$a_1 = (2)(1)$$

$$a_2 = (2)(1)$$

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$, 0 with 26 fixed points

$$a_2 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}, 1 \text{ with 2 fixed points}$$

Kernel has order 4 and is generated by:

$$b_1 = \begin{pmatrix} 7 & 10 & 17 & 2 & 3 \\ 22 & 24 & 20 & 8 & 13 \\ 13 & 5 & 3 & 24 & 10 \\ 18 & 12 & 8 & 21 & 2 \\ 2 & 14 & 23 & 0 & 1 \end{pmatrix}, 1$$

The kernel has 4079 orbits on the quadric.

The orbit length are $[4^{4062}, 2^{11}, 1^6]$