1 BLT set 1 over GF(3)

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

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

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

$P_3 = (0, 1, 1, 2, 1)$

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

Stabilizer of order 192 is generated by:

$$g_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 2 & 2 & 1 & 2 \\ 0 & 2 & 0 & 0 & 2 \\ 0 & 1 & 0 & 2 & 0 \end{pmatrix}$$

$$g_2 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 2 & 0 & 0 & 2 & 1 \\ 2 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$g_3 = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 2 & 1 \\ 1 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$g_4 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 2 & 2 & 1 & 2 \\ 0 & 2 & 0 & 0 & 0 \\ 2 & 2 & 0 & 2 & 1 \\ 2 & 1 & 0 & 1 & 2 \end{pmatrix}$$

$$g_5 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$g_6 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

The induced group has order 24 and is generated by:

$g_1 =$(2, 3)

$g_2 =$id

$g_3 =$id

$g_4 =$(1, 3, 2)

$g_5 =$id

$g_6 =$(3, 4)

group order is small, so we list all elements $a_1 =$id

$a_2 =$id

$a_3 =$(3, 4)

$a_4 =$(3, 4)

$a_5 =$id

$a_6 =$id

$a_7 =$(3, 4)

$a_8 =$(3, 4)

$a_9 =$id

$a_{10} =$id

$a_{11} =$(3, 4)

$a_{12} =$(3, 4)

$a_{13} =$id

$a_{14} =$id

$a_{15} =$(3, 4)

$a_{16} =$(3, 4)

$a_{17} =$(2, 3)

$a_{18} =$(2, 3)

$a_{19} =$(2, 3, 4)

$a_{20} =$(2, 3, 4)

$a_{21} =$(2, 3)

$a_{22} =$(2, 3)

$a_{23} =$(2, 3, 4)

$a_{24} =$(2, 3, 4)

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$

$$a_2 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 2 & 0 & 0 & 2 & 1 \\ 2 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 1 & 0 & 0 & 1 & 2 \\ 1 & 0 & 0 & 2 & 1 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 2 & 0 & 0 & 2 & 1 \\ 2 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 2 \\ 1 & 0 & 0 & 2 & 1 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 2 & 1 \\ 1 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 2 & 0 & 0 & 1 & 2 \\ 2 & 0 & 0 & 2 & 1 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 1 & 0 & 0 & 2 & 1 \\ 1 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 2 & 0 & 0 & 1 & 2 \\ 2 & 0 & 0 & 2 & 1 \end{pmatrix}$$

$$a_{13} = \begin{pmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 2 & 0 \end{pmatrix}$$

$$a_{14} = \begin{pmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

$$a_{15} = \begin{pmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 2 & 0 \end{pmatrix}$$

$$a_{16} = \begin{pmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

$$a_{17} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 2 & 2 & 1 & 2 \\ 0 & 2 & 0 & 0 & 2 \\ 0 & 1 & 0 & 2 & 0 \end{pmatrix}$$

$$a_{18} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 2 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 2 & 0 & 1 & 0 \end{pmatrix}$$

$$a_{19} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 2 & 1 \\ 0 & 2 & 0 & 0 & 2 \\ 0 & 1 & 0 & 2 & 0 \end{pmatrix}$$

$$a_{20} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 2 & 2 & 1 & 2 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 2 & 0 & 1 & 0 \end{pmatrix}$$

$$a_{21} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 2 & 2 & 1 & 2 \\ 2 & 2 & 0 & 2 & 1 \\ 2 & 1 & 0 & 1 & 2 \end{pmatrix}$$

$$a_{22} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 2 & 1 \\ 1 & 1 & 0 & 1 & 2 \\ 1 & 2 & 0 & 2 & 1 \end{pmatrix}$$

$$a_{23} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 2 & 1 \\ 2 & 2 & 0 & 2 & 1 \\ 2 & 1 & 0 & 1 & 2 \end{pmatrix}$$

$$a_{24} = \begin{pmatrix} 0 & 0 & 0 & 2 & 2 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 2 & 2 & 1 & 2 \\ 1 & 1 & 0 & 1 & 2 \\ 1 & 2 & 0 & 2 & 1 \end{pmatrix}$$

Kernel has order 8 and is generated by:

$$b_1 = \begin{pmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 2 & 0 & 0 & 2 & 1 \\ 2 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$b_2 = \begin{pmatrix} 2 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 2 & 0 \end{pmatrix}$$

$$b_3 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$b_4 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

The kernel has 13 orbits on the quadric.

The orbit length are $[4^9, 1^4]$

There are 1 orbits on the BLT set.

The orbit length are $[4]$

The orbits are:

$O_0 = \{1, 2, 3, 4\}$ (length 4)