



Detailed mathematical representation of the polar encoding process. The input vector consists of $K-N$ bits (blue) and K frozen bits (black). The frozen bits are represented as b_0, b_1, b_2, b_3 . The input vector is multiplied by a generator matrix (a 9x9 matrix of 0s and 1s) to produce the output vector $x_0, x_1, x_2, x_3, x_4, x_5, x_6, x_7$.

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ b_0 \\ 0 \\ b_1 \\ b_2 \\ b_3 \end{bmatrix} \times \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} x_0 \\ x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \end{bmatrix}$$