

# QC-LDPC

"H" Base matrix The parity-check matrix  $H$  of a  $(J, L)$  regular LDPC code of length  $N = p \cdot L$  matrix dispersion. Can be represented by

$$H = \begin{bmatrix} I(P_{0,0}), & I(P_{0,1}), & \dots & I(P_{0,L-1}) \\ I(P_{1,0}), & I(P_{1,1}), & \dots & I(P_{1,L-1}) \\ \vdots & & & \vdots \\ I(P_{J-1,0}), & I(P_{J-1,1}), & \dots & I(P_{J-1,L-1}) \end{bmatrix}$$

$p$ : expansion factor or lifting degree

$I(P_{j,l})$  represents a circulant permutation matrix (CPM) of size  $p \times p$  with a "1" at column  $(r + P_{j,l}) \bmod p$  for row  $r$ ,

$$0 \leq r \leq p-1, \quad 0 \leq P_{j,l} \leq p-1$$

$p=5$   $I(0)$  is a  $5 \times 5$  identity matrix

$$P_{jl=1} \quad \underbrace{I(1)}_{\text{ }} = \begin{pmatrix} 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \end{pmatrix} \quad P_{jl=2} \quad I(2) = \begin{pmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{pmatrix}$$