5G NR Base matrices:

Base matrix 1 : Size $[46 \times 68]$

2 : Size $[42 \times 52]$

example :

expansion factor = 3

BM of size = 3×4

elements of matrix = $[-1, 0, 1, \ldots$ expfactor $-1]$

ie = $[-1, 0, 1, 2]$ if exp fact = 3

$$BM = \begin{bmatrix} -1 & 2 & 1 & 0 \\ 1 & 0 & 2 & 1 \\ 2 & -1 & 1 & 0 \end{bmatrix}$$

element '2' of exp factor = 3 will expand to a 3 identity binary matrix of size = 3, right shifted by 2.

'2' = $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ '0' = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

'1' = $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ '-1' = $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ All zero matrix

layered min sum decoding in 5G LDPC codes is done across each of the BM row entries.

eg: exp factor = 12, and BM1 = [46 x 68]

there are 46 layers with 12 rows in each layer.

Expansion factor : Z_c

$$Z_c = a \times 2^j$$

$$a = [2, 3, 5, 7, 9, 11, 13, 15]$$

a	j
2	1, 2, ... 7
3	1, 2, .. 7
5	1, 2, ... 6
7	1, 2 .. 5
9	1, 2 ... 5
11	1, 2, .. 5
13	1, 2 .. 4
15	1, 2 .. 4

~~max iteration~~

max exp factor

$= (a=3, j=7)$

$= 3 \times 2^7 = 384$