

$$a_1 \times [1, -1, -1, 1]$$

$$= [a_1, -a_1, -a_1, a_1]$$

chips

$$N = 4 \text{ Chips per symbol}$$

Example:

$$\text{Symbol rate} = 1 \text{ Kbps}$$

BW Required
= 1 KHz

$$BW = \frac{1}{T_s}$$

$$= \frac{1}{1 \text{ ms}}$$

$$= 1 \text{ KHz}$$

Time per symbol

$$= \frac{1}{1000} = 1 \text{ ms}$$

$$T_s = 1 \text{ ms}$$

1000 sym/sec

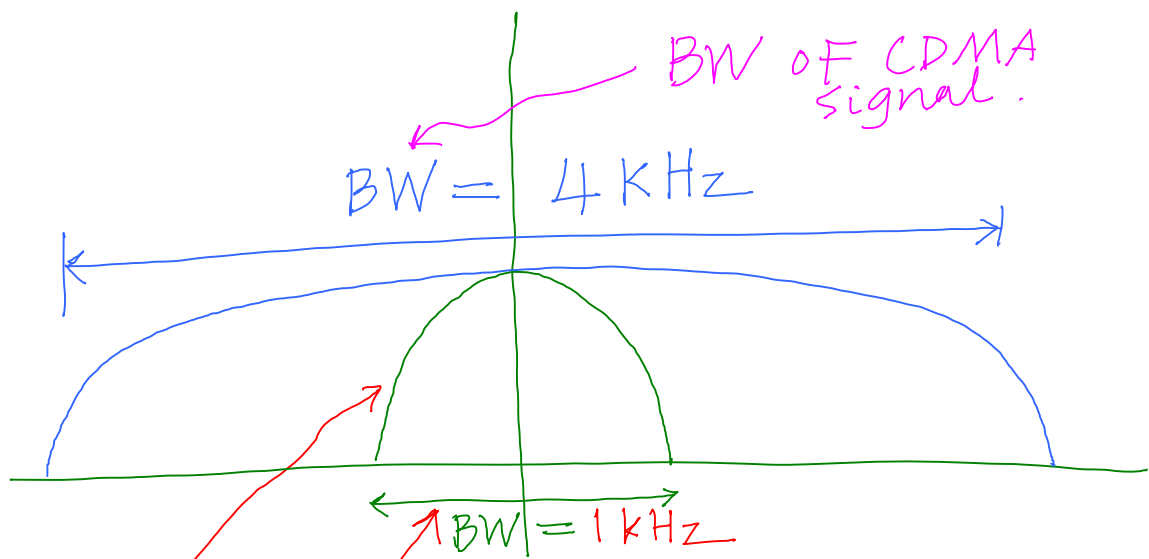
Chip Time

$$T_c = \frac{T_s}{N} = \frac{1\text{ms}}{4}$$

$$T_c = 0.25\text{ms}$$

BW of CDMA system

$$= \frac{1}{T_c} = \frac{1}{0.25\text{ms}} = 4\text{KHz}$$



Spectrum

BW of original signal is spread.

Original signal

Therefore, CDMA system
is also known as a

SPREAD SPECTRUM
system

IF code length = N

{ BW or Spectrum is spread
by a factor of N .

→ Therefore, CDMA codes are
also termed as spreading
codes.

Length of code N
= Spreading Factor.