ECS455 Chapter 2

Cellular Systems

2.3 Sectoring

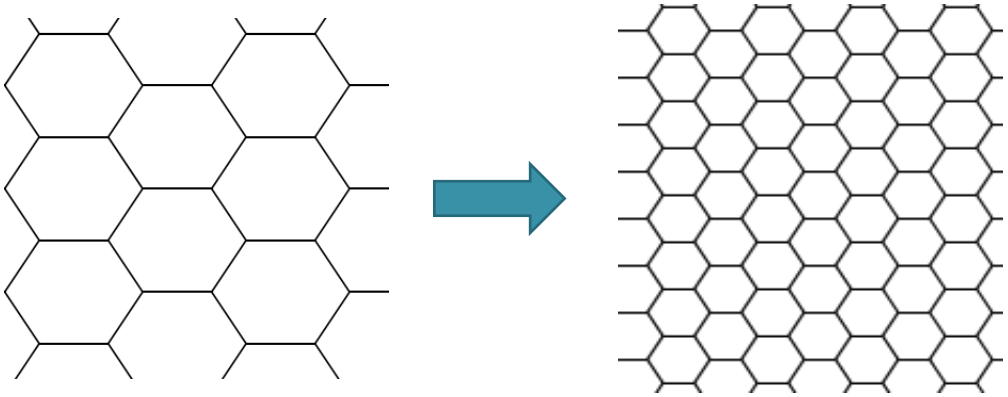
$$SIR = \frac{1}{K}\left(\sqrt{3N}\right)^{\alpha}$$

Office Hours:
BKD 3601-7
Tuesday 15:00-16:00
Friday 14:00-16:00

Improving Coverage and Capacity

- As the demand for wireless service increases, the number of channels assigned to a cell eventually becomes insufficient to support the required number of users.
- At this point, cellular design techniques are needed to provide more channels per unit coverage area.
- Easy!?

$$C = \frac{A_{\text{total}}}{A_{\text{cell}}} \times \frac{S}{N}$$



Sectoring (N = 7)

No sectoring $m = 18$ channels/cell

120° : $\frac{18}{3} = 6$ channels/sector

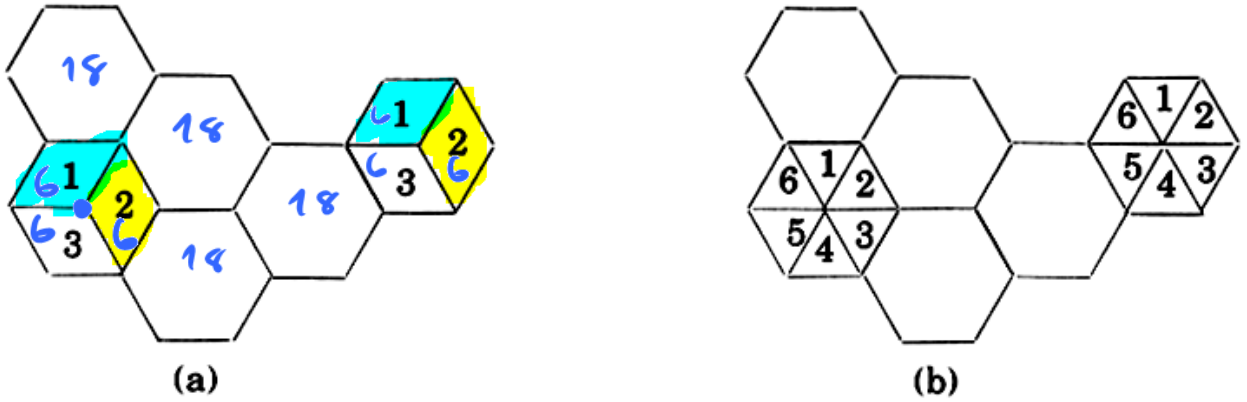


Figure 3.10 (a) 120° sectoring; (b) 60° sectoring.

Sectoring (N = 7)

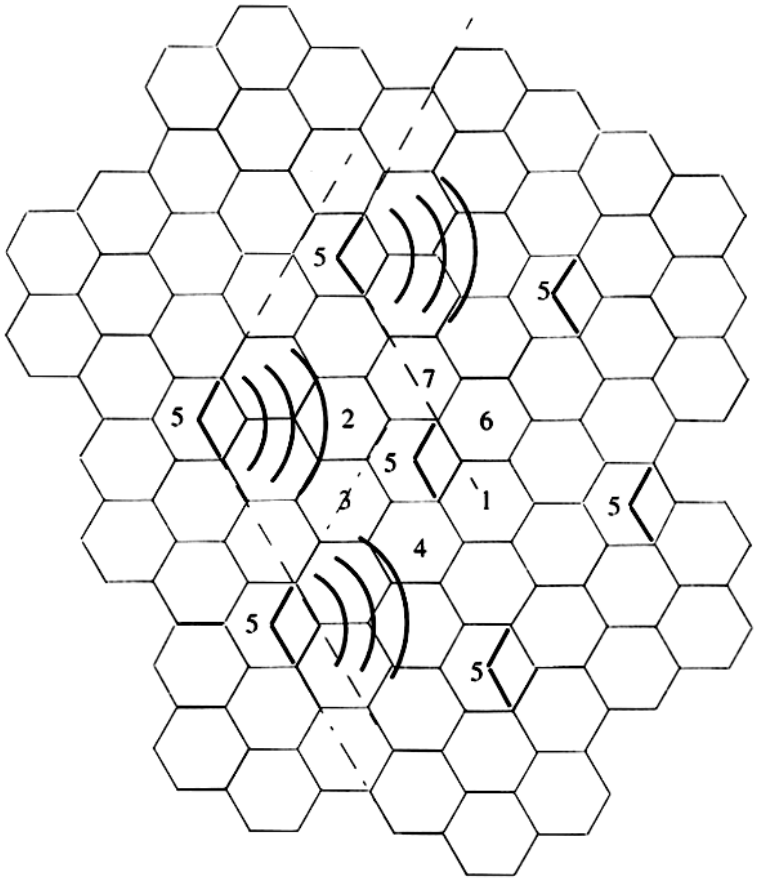
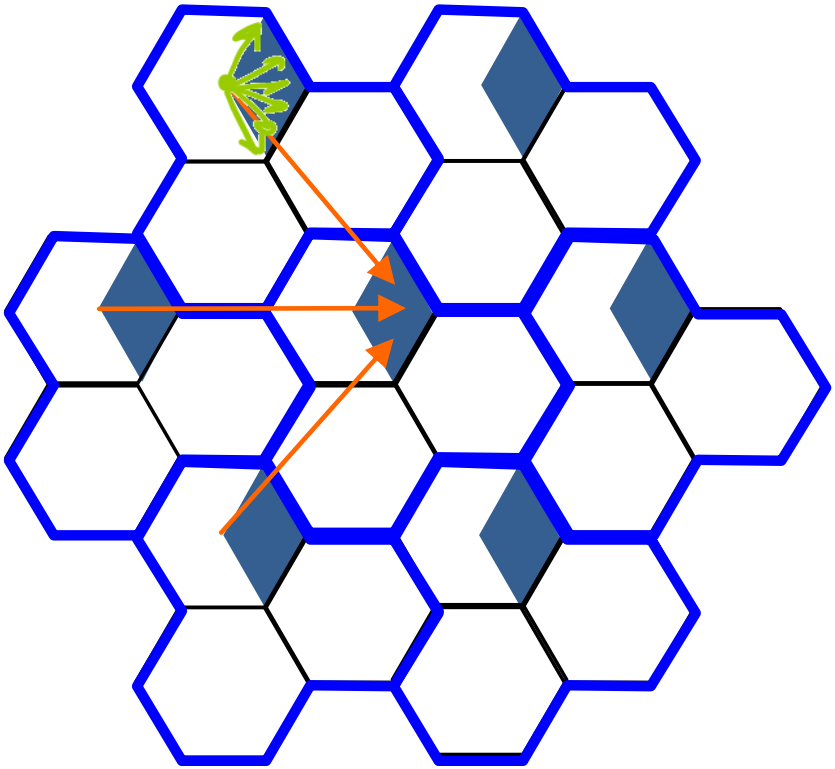
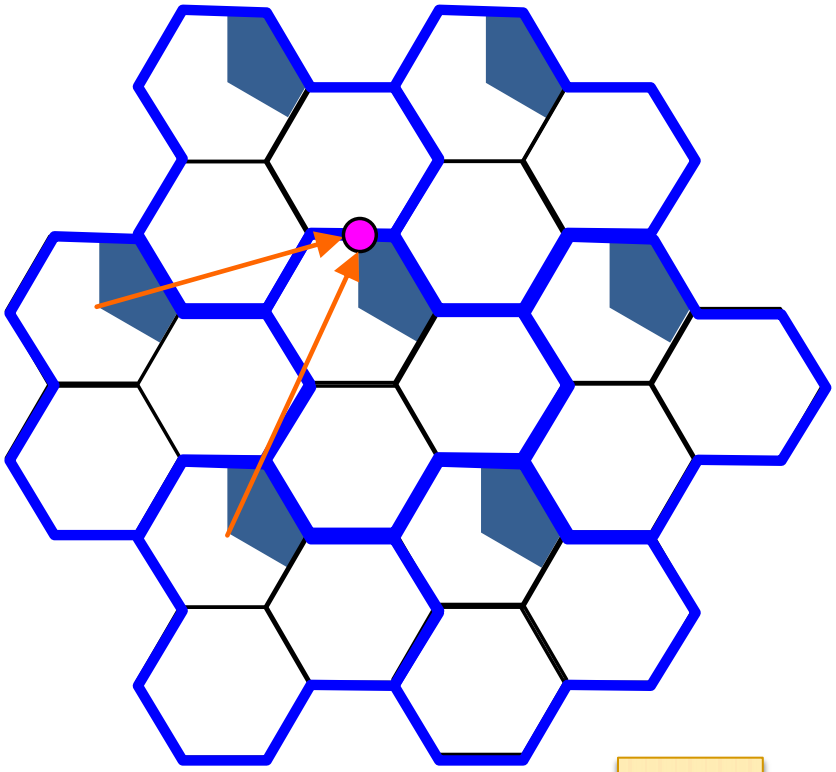


Figure 3.11 Illustration of how 120° sectoring reduces interference from co-channel cells. Out of the 6 co-channel cells in the first tier, only two of them interfere with the center cell. If omnidirectional antennas were used at each base station, all six co-channel cells would interfere with the center cell.

Sectoring (N = 3, 120°)

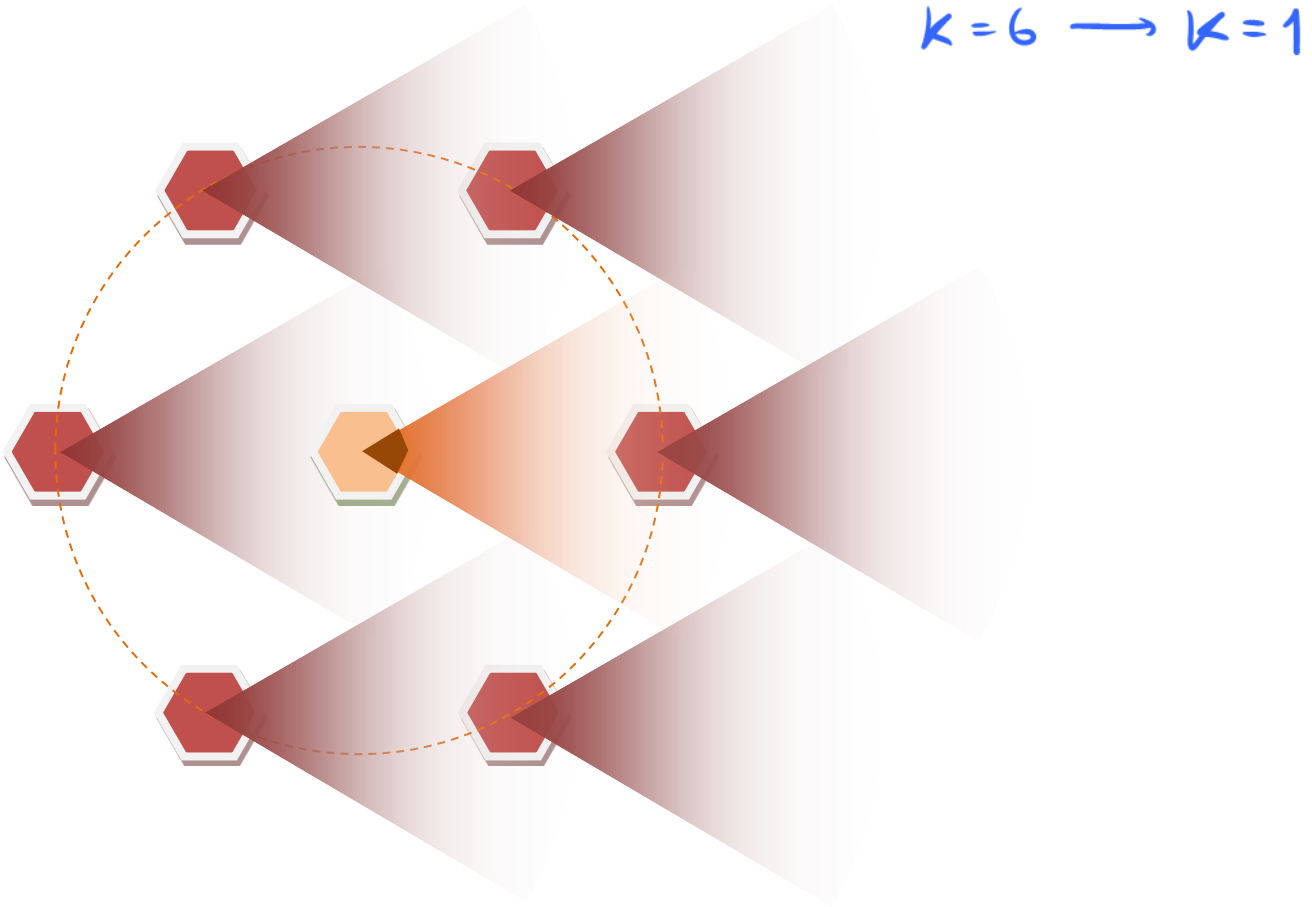
$$\frac{S}{I} \approx \frac{1}{K}\left(\sqrt{3N}\right)^{\gamma}$$





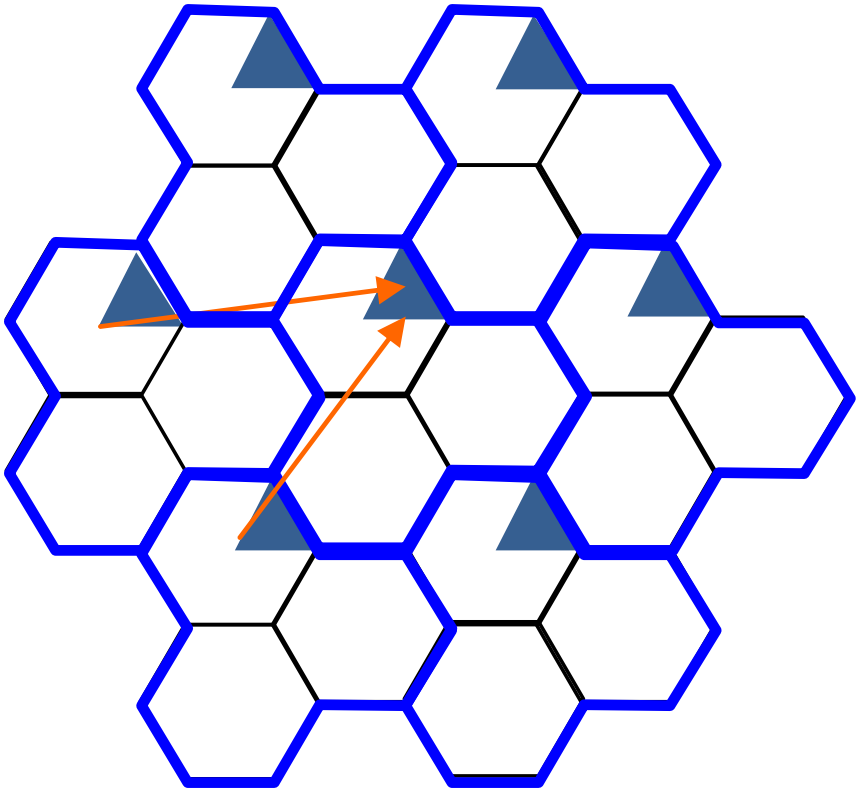
K = 2

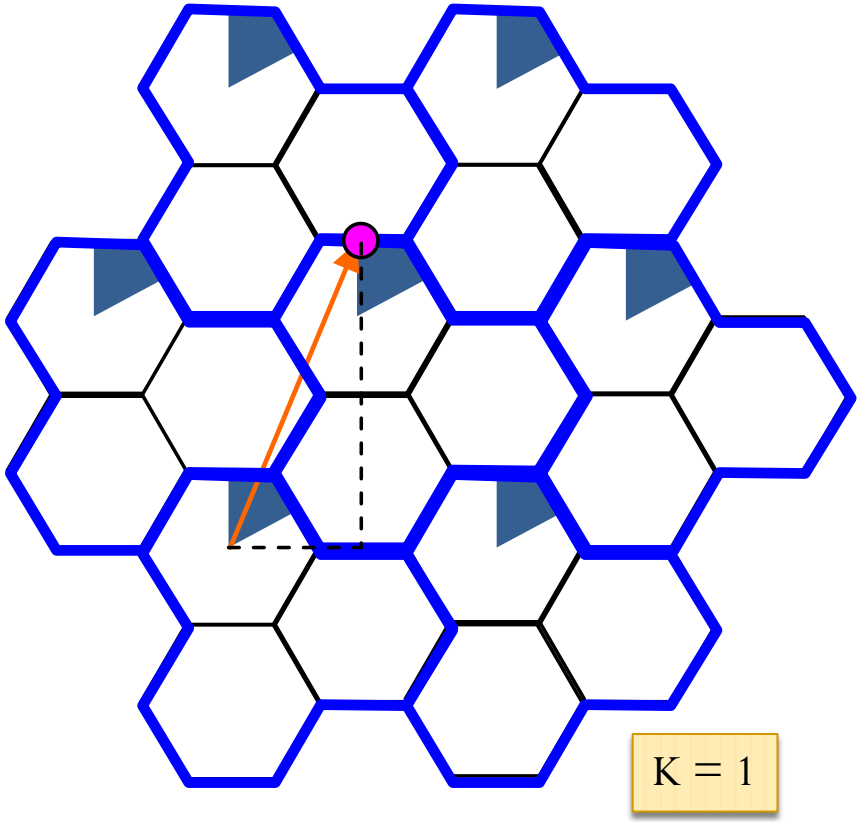
60 Degree Sectoring



Sectoring (N = 3 , 60°)

$$\frac{S}{I} \approx \frac{1}{K}\left(\sqrt{3N}\right)^{\gamma}$$





$$\frac{S}{I} \approx \frac{1}{K}\left(\sqrt{3N}\right)^{\gamma} \qquad C = \frac{A_{\text{total}}}{A_{\text{cell}}} \times \frac{S}{N}$$

Sectoring

- Advantages
  - Assuming seven-cell reuse, for the case of 120° sectors, the number of interferers in the first tier is reduced from six to two.
    - This reduction lead to the increase of SIR.
    - The increase in SIT can be traded with reducing the cluster size which increase the capacity.

- Disadvantages
  - Increase number of antennas at each base station.
  - Decrease **trunking efficiency** due to channel sectoring at the base station.
    - The available channels in the cell must be subdivided and dedicated to a specific antenna.