



# **SNS COLLEGE OF TECHNOLOGY**

Coimbatore – 35

**An Autonomous Institution**

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

19ECT311 / Wireless Communication

III ECE/ VI SEMESTER

Unit I - **FUNDAMENTALS OF WIRELESS COMMUNICATION**

**Topic 8 : Improving Coverage and Capacity**



# Improving Capacity in Cellular Systems



- Methods for improving capacity in cellular systems
  - Cell Splitting: subdividing a congested cell into smaller cells
  - Sectoring: directional antennas to control the interference and frequency reuse
  - Coverage zone : Distributing the coverage of a cell and extends the cell boundary to hard-to-reach place

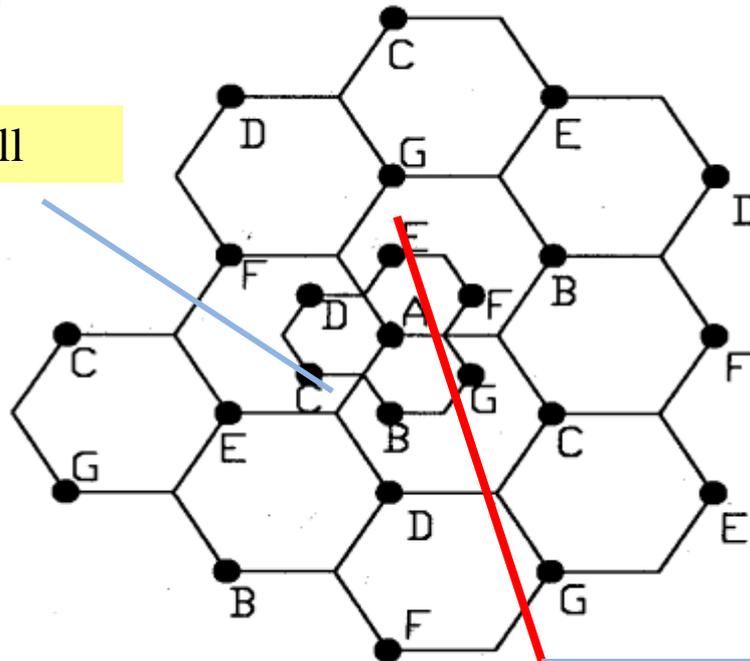




# Cell Splitting

- Split congested cell into smaller cells
  - Preserve frequency reuse plan
  - Reduce transmission power

Microcell



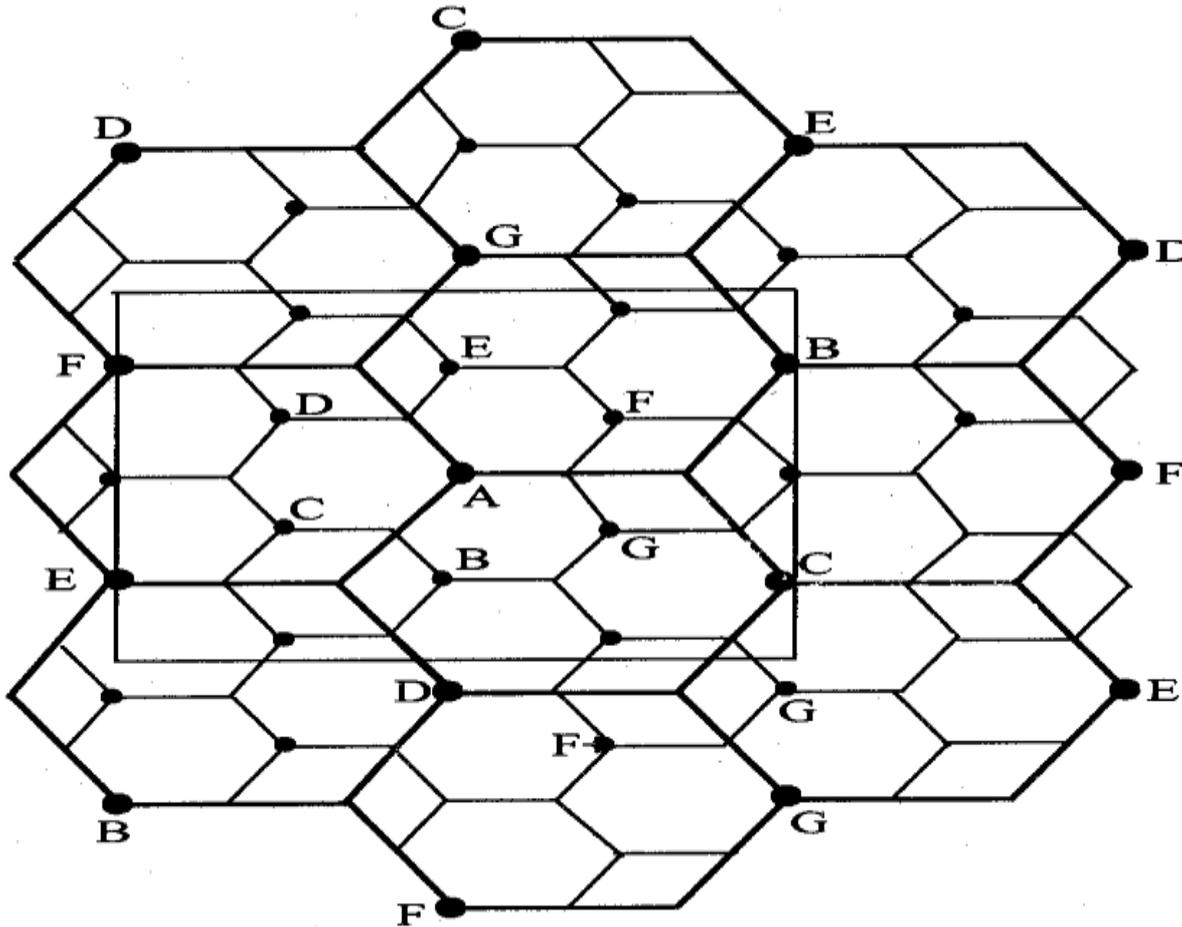
Reduce  $R$  to  $R/2$





# Cell Splitting

Illustration of cell splitting within a 3 km by 3 km square





# Cell Splitting

- Transmission power reduction from  $P_{t1}$  to  $P_{t2}$
- Examining the receiving power at the new and old cell boundary

$$P_r[\text{at old cell boundary}] \propto P_{t1} R^{-n}$$

$$P_r[\text{at new cell boundary}] \propto P_{t2} (R/2)^{-n}$$



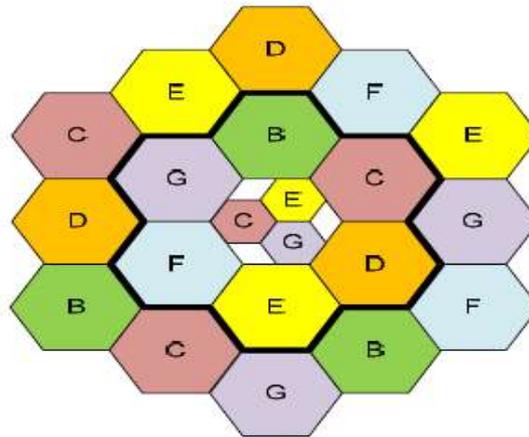
- If we take  $n = 4$  and set the received power equal to each other

$$P_{t2} = \frac{P_{t1}}{16}$$



# Cell Splitting

- The transmit power must be reduced by 12 dB in order to fill in the original coverage area
- Problem: if only part of the cells are splitted
  - Different cell sizes will exist simultaneously
- Handoff issues - high speed and low speed traffic can be simultaneously accommodated





# Activity



## **In class activity:**

What are the next three numbers in this series?

4, 6, 12, 18, 30, 42, 60, 72, 102, 108, ?, ?, ?

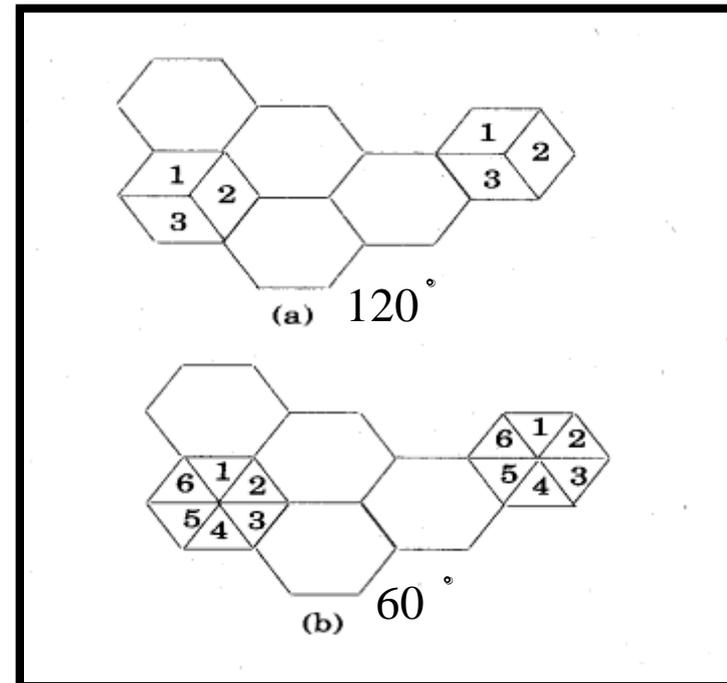
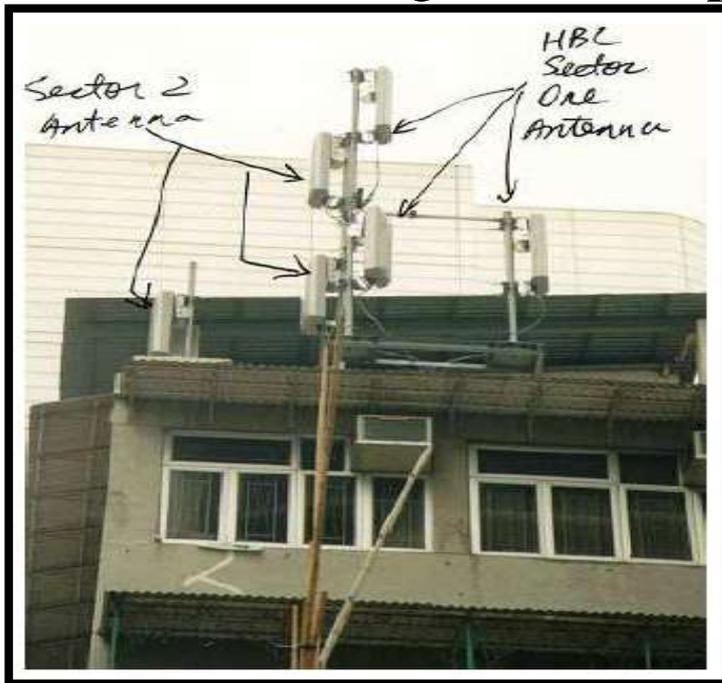




# Sectoring

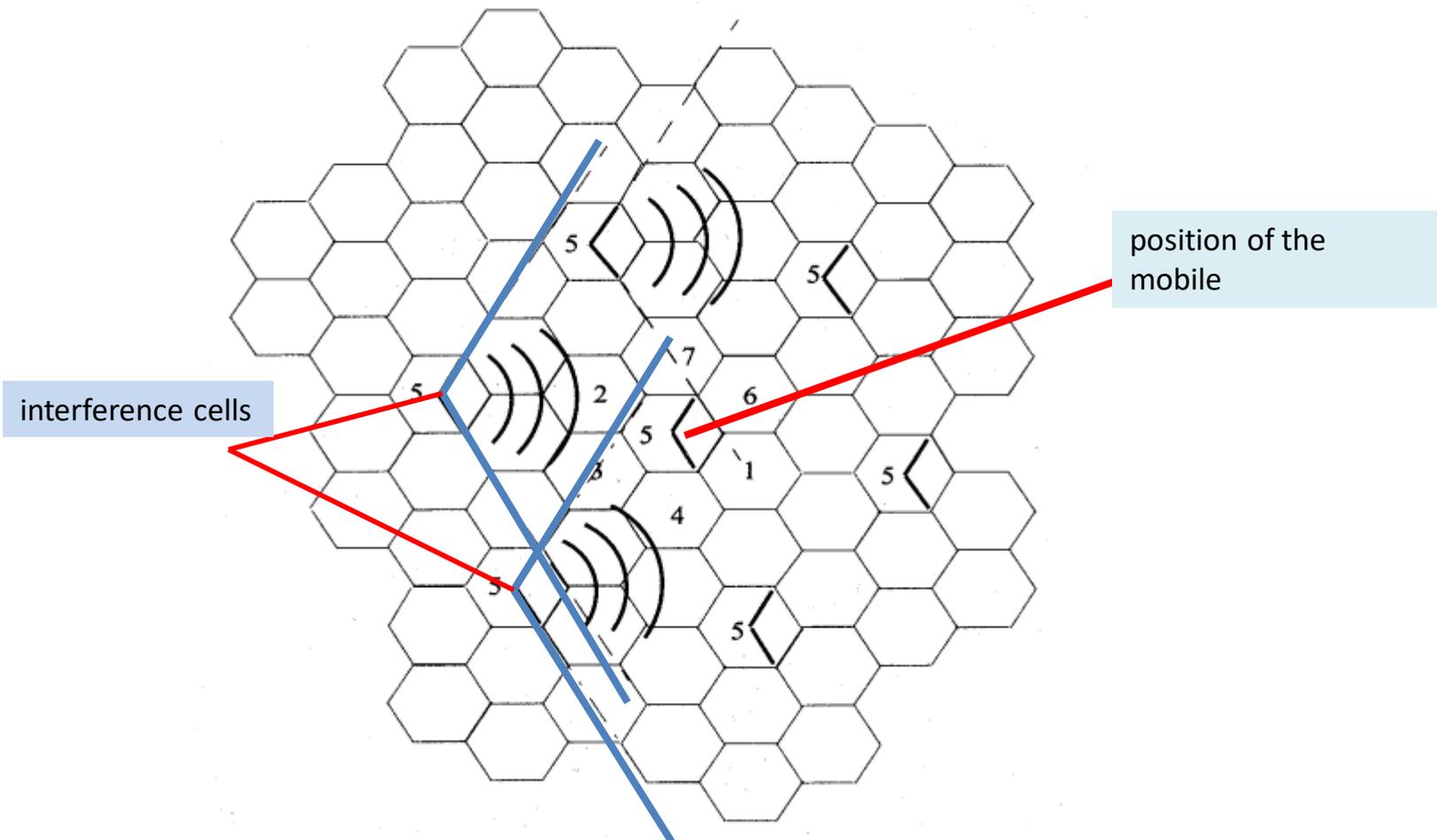


- Decrease the *co-channel interference* and keep the cell radius  $R$  unchanged
  - Replacing single omni-directional antenna by several directional antennas
  - Radiating within a specified sector





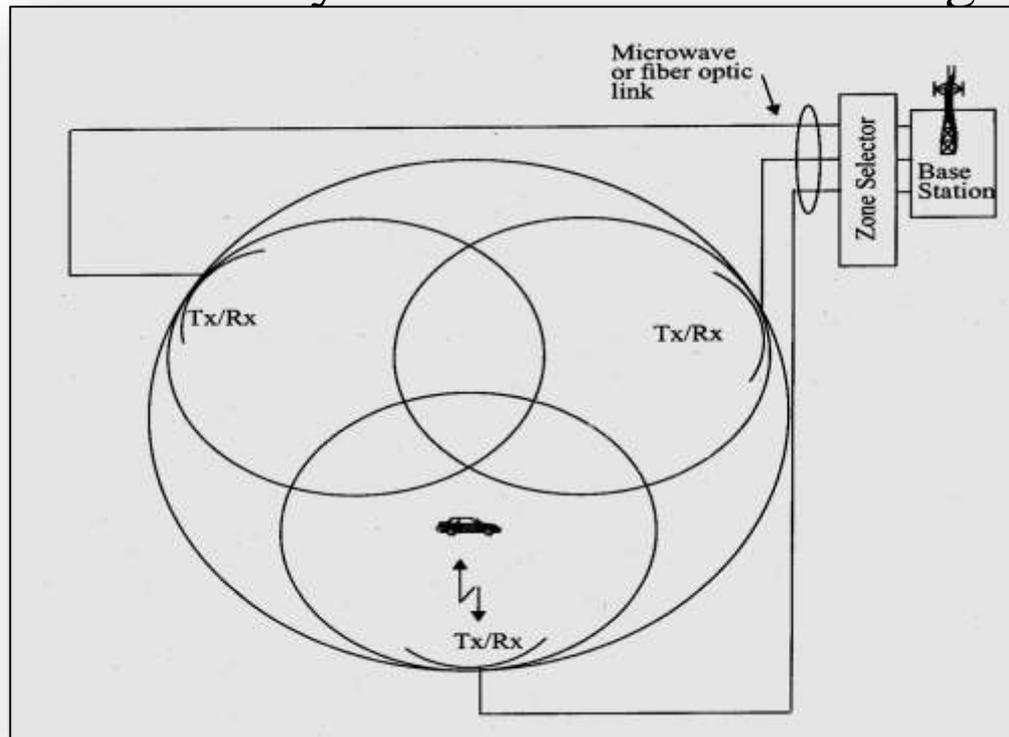
# Interference Reduction





# Microcell Zone Concept

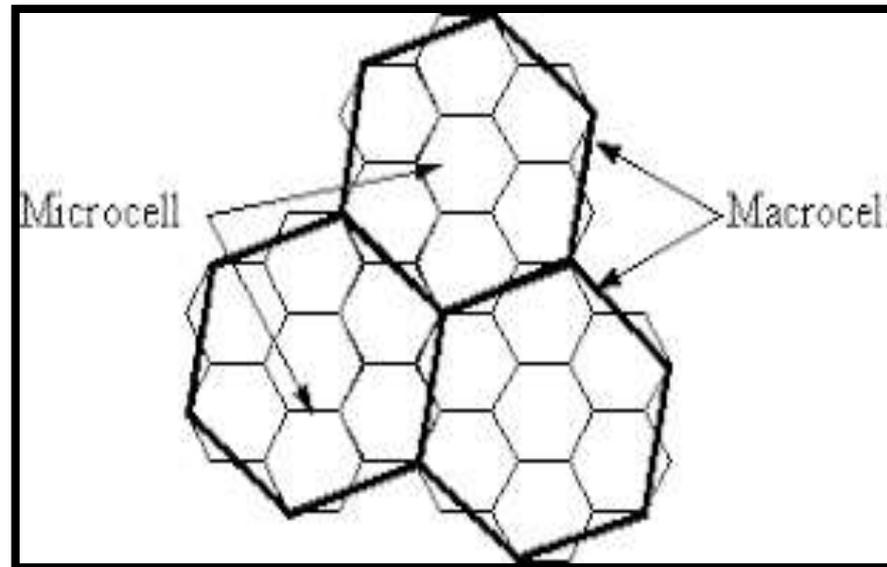
- Antennas are placed at the outer edges of the cell
- Any channel may be assigned to any zone by the base station
- Mobile is served by the zone with the strongest signal





# Microcell Zone Concept

- Handoff within a cell
  - No channel re-assignment
  - Switch the channel to a different zone site
- Reduce interference
  - Low power transmitters are employed

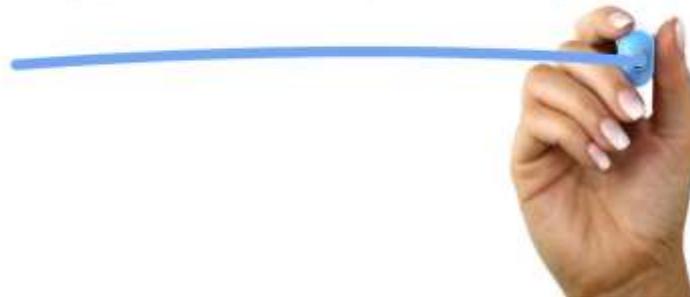




# ASSESSMENT



ASSESSMENT



Illustrate the cell splitting concept with suitable example.