



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

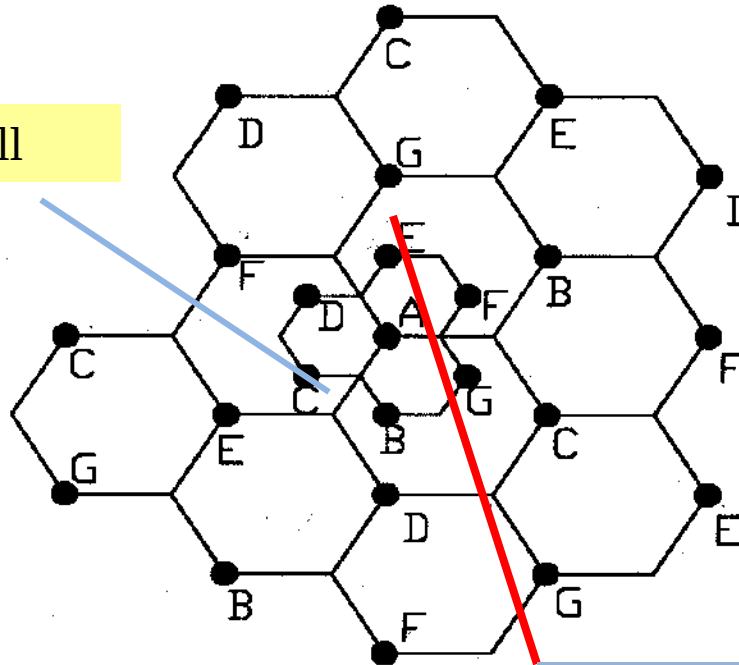




Cell Splitting

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

Microcell



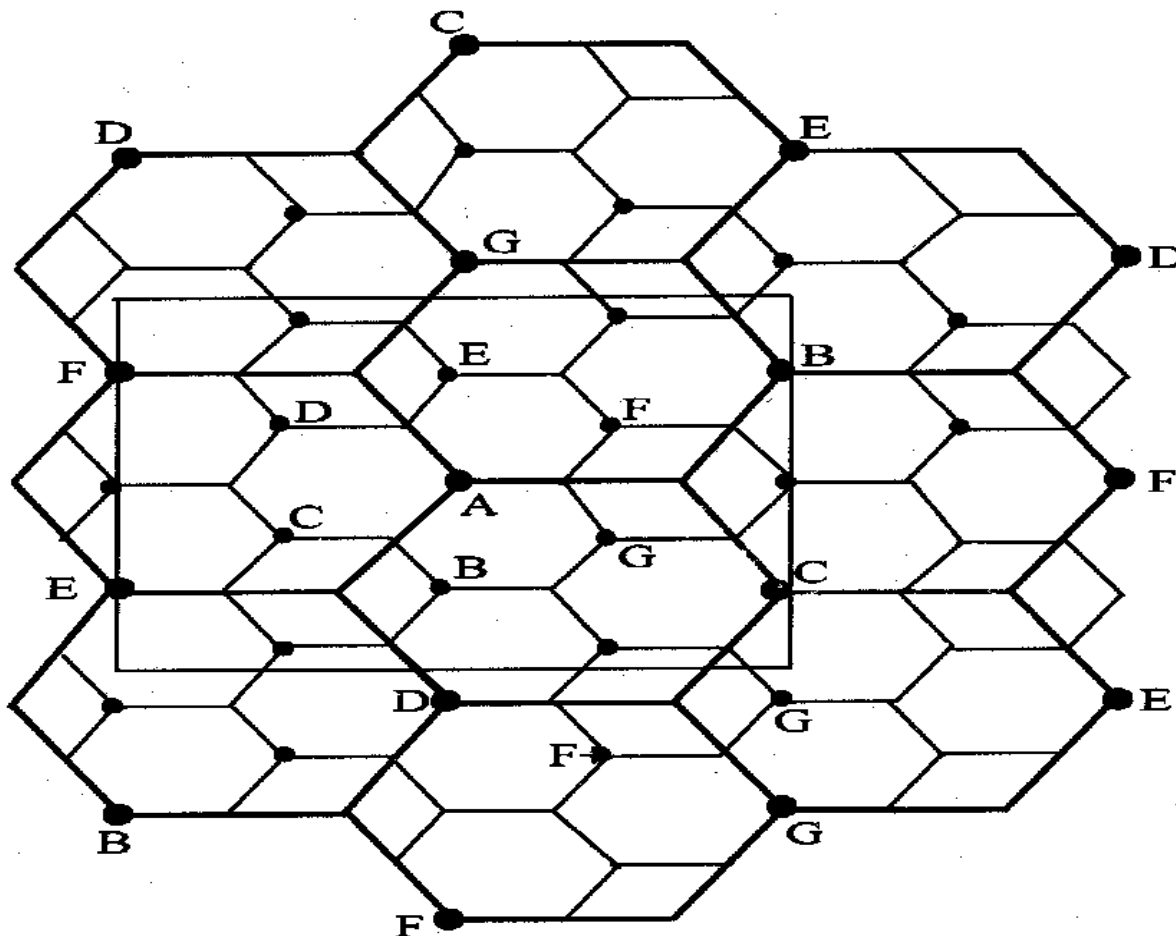
Reduce R to $R/2$





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

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

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



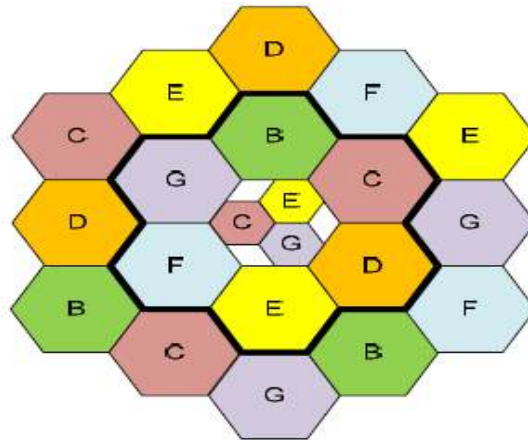
- If we take $n = 4$ and set the received power equal to each other

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



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, ?, ?, ?

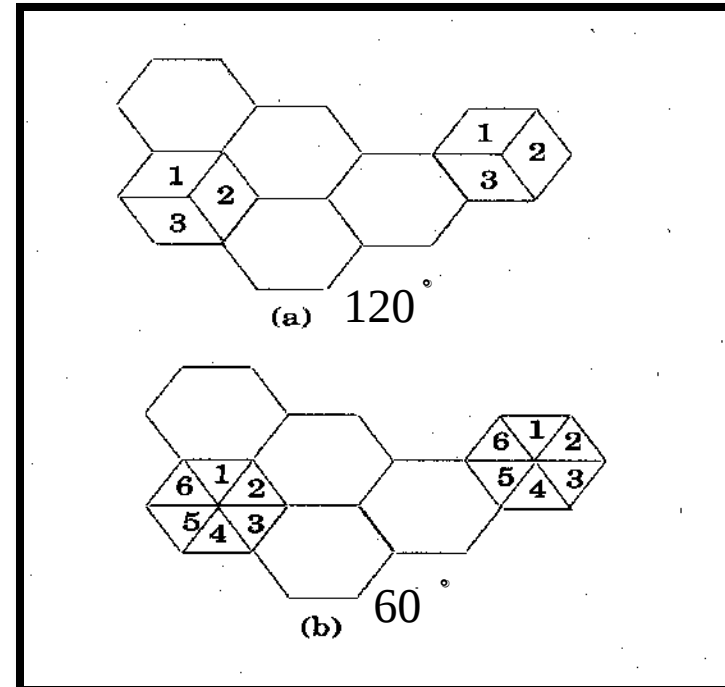
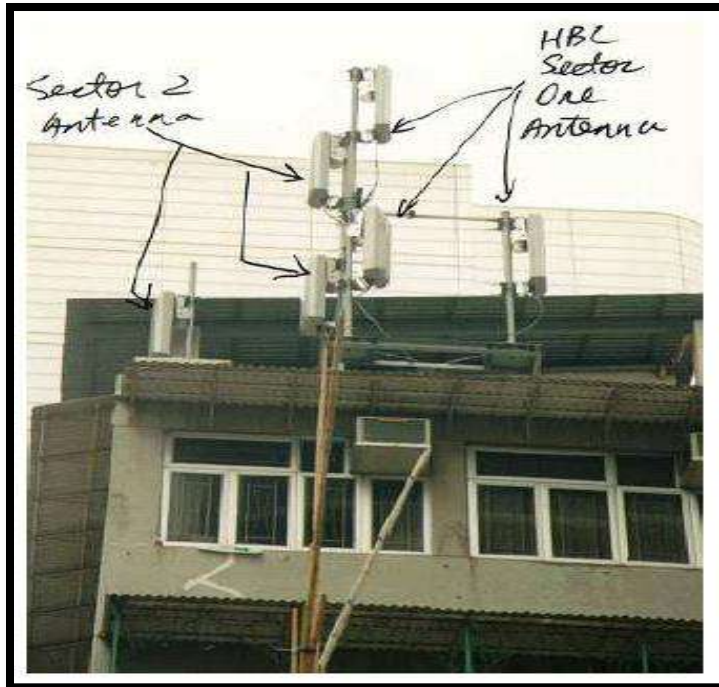




Sectoring

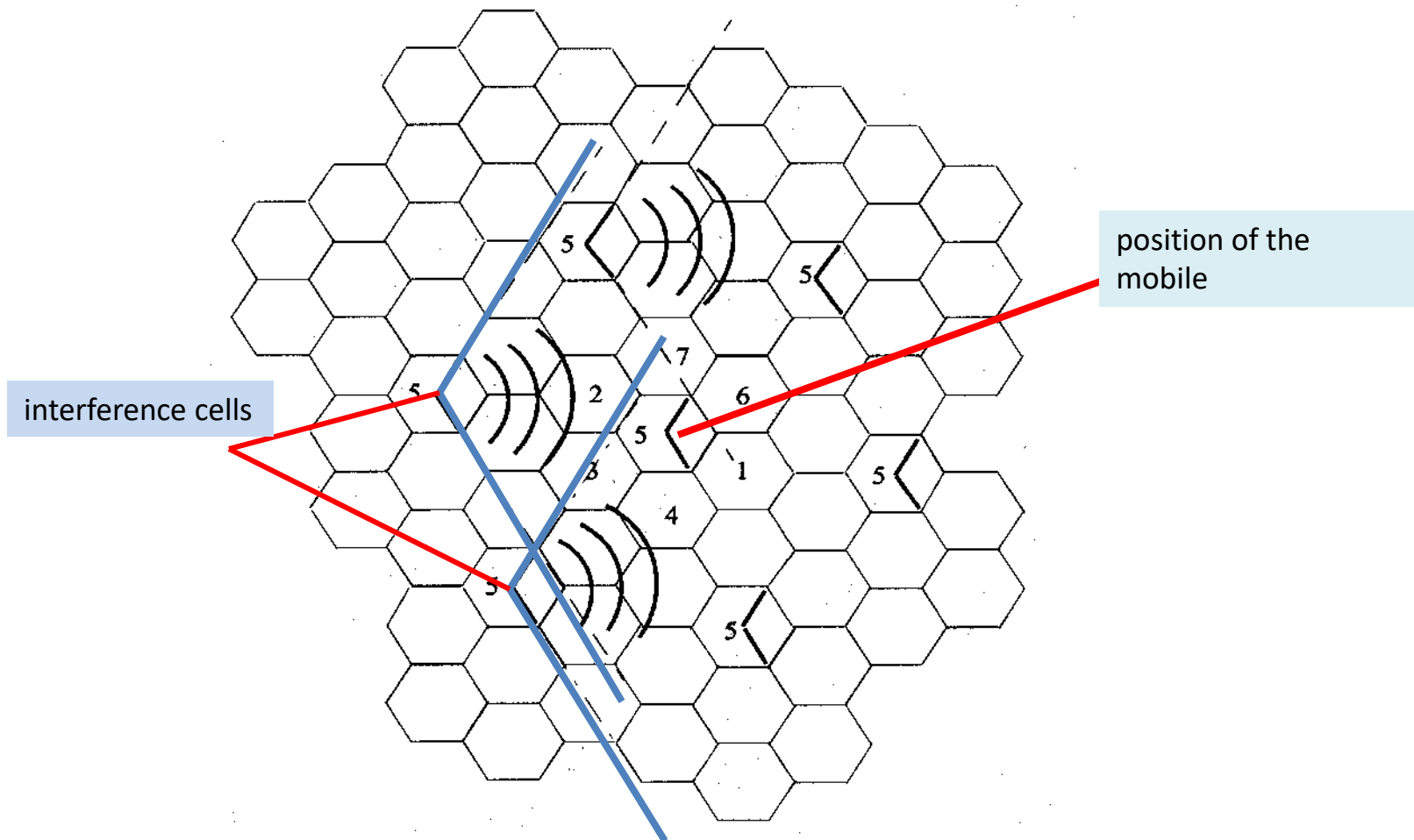


- Decrease the *co-channel interference* and keep the cell radius R unchanged
 - Replacing single omni-directional antenna by several directional antennas
 - Radiating within a specified sector





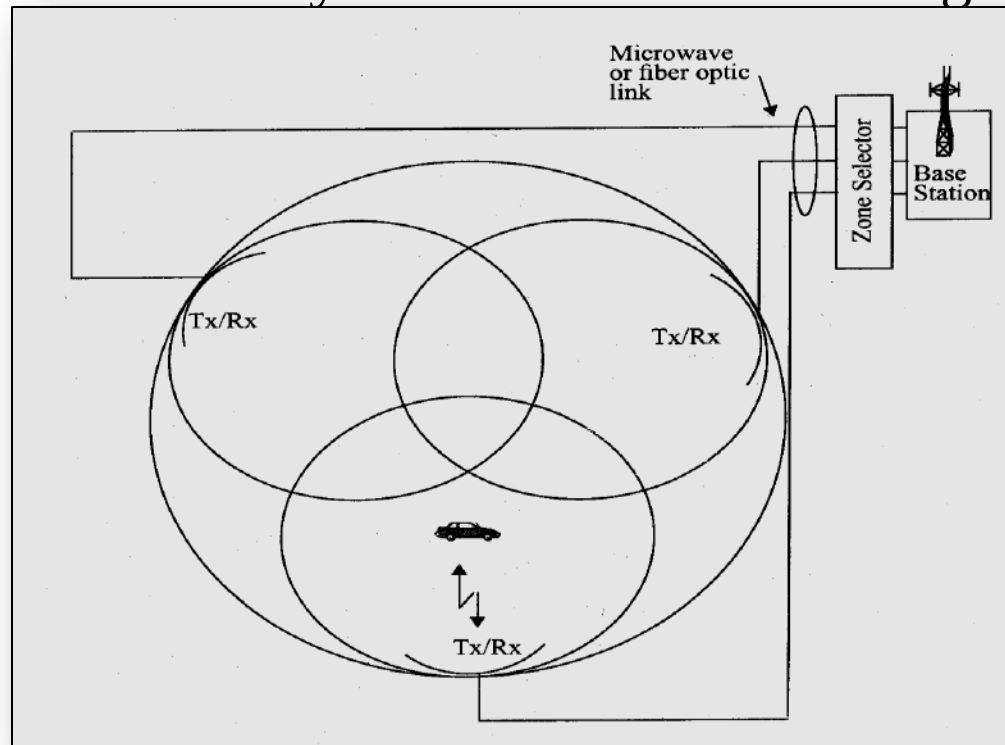
Interference Reduction





Microcell Zone Concept

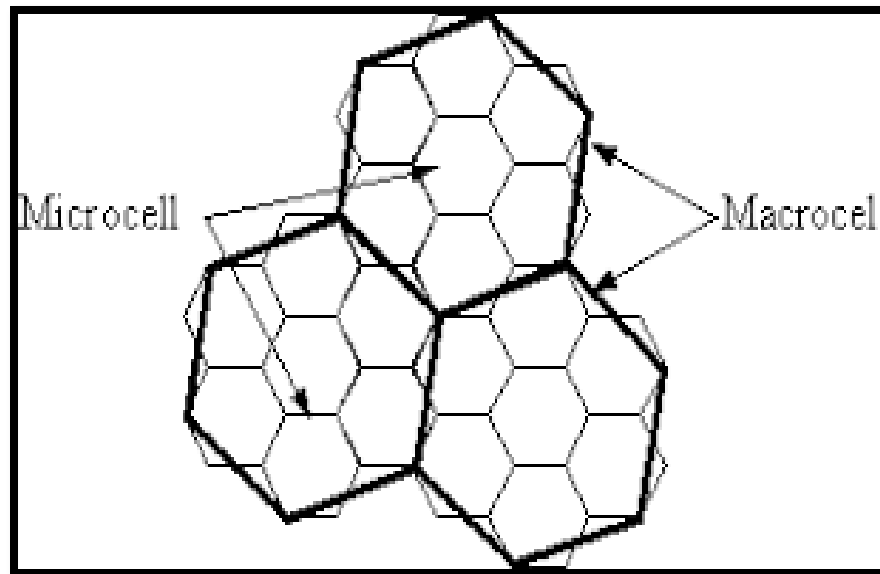
- Antennas are placed at the outer edges of the cell
- Any channel may be assigned to any zone by the base station
- Mobile is served by the zone with the strongest signal





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



Illustrate the cell splitting concept with suitable example.