8.5.2 BCCH AND TCH FREQUENCY PLANS

The Spectrum allocation should be considered to determine if a change to frequency allocation is necessary. The diagram below shows a typical frequency allocation for the 900 band.

Section 8 – Optimisation Activities

BCCH and TCH Frequency Plans

- BCCH is typically planned with low frequency re-use (long re-use distance) in order to ensure high quality.
- The BCCH plan should take into account: site design, terrain and topography and subscriber distribution. A good BCCH plan can generally be achieved with 14 - 15 carriers.
- The TCH plan requires the same considerations as BCCH, but may also employ:
  - Frequency hopping - synthesiser or baseband
  - Multiple Re-use Patterns - giving tighter re-use on lower TCH layers
  - Concentric multi-layer cell arrangements in which BCCH is only required on one band

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The number of channels required to make a good BCCH plan will vary according to a number of factors:

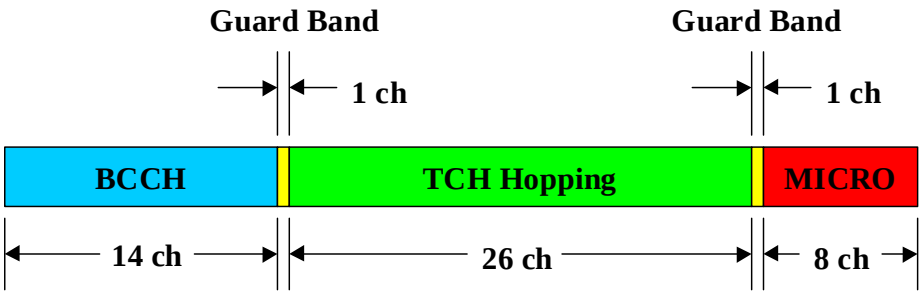
- Site design (high sites etc.)
- Terrain and topography
- Subscriber distribution
- Regularity of cell plan

In a well optimised network, it is generally possible to produce a high quality BCCH plan within 14-15 channels.

The same issues with the BCCH plan also affect frequency planning of the non-BCCH (TCH) carriers. However there are additional techniques available for the TCH layer to improve re-use efficiency and increase capacity, such as:

- Synthesizer Frequency Hopping
- Baseband Frequency Hopping
- MRP (Multiple Reuse Pattern)
- Concentric Cell

BCCH and TCH Frequency Plans



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8.5.3 HIGH SITE REPLACEMENT

In terms of RF design, the problem with this approach is that the legacy sites from the launch rollout phase tend to be high and prominent, and increasingly contribute uplink and downlink interference into the network as the number of lower sites around them increases. The net effect of this is to minimise frequency re-use efficiency and limit the capacity of the network.
Therefore a process is required to identify and eliminate these interferers to allow network growth to continue and high quality to be maintained.

A typical process for replacing or modifying high sites would be as follows:

- From BSS performance statistics and call trace logs, identify those cells which contribute the most interference to the largest number of other cells.
- Develop a plan for de-commissioning the site, or lowering the antennas to a position consistent with surrounding sites if possible. Include the possible requirements for additional in-fill sites due to the loss of coverage from the high site.
- As new low sites are integrated, de-commission or modify the high site in such a way as to cause minimum disruption to coverage. Prioritise the integration of any required new sites to target high sites in order of severity.

High Site Problems

- Initial roll-out tends to concentrate on higher sites
- High sites potentially cause excessive interference with subsequent lower site roll-out
- A Typical process for replacement could include:
  - From performance parameters, identify those cell interference-contributing the most interference to the most cells
  - Develop plan to lower antennas or decommission these sites. This may require additional lower sites to cover any coverage gaps
  - Prioritise decommissioning and integration of new sites to minimise disruption to services

8.5.4 ANTENNA DOWN-TILTING

Antenna Down-Tilting

- An option for adjusting cell coverage
  - e.g. down tilting may direct coverage deeper into a building
- Antenna tilt may be:
  - mechanical – operator set – affects directional coverage
  - electrical – manufacturer set – affects omni-directional coverage
- Omni antennas may have electrical tilt but not mechanical
- New technologies allow for remote electrical tilting