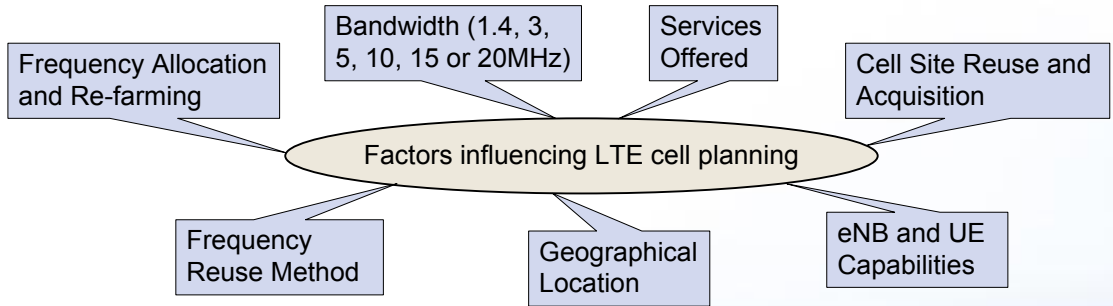


LTE Planning Principles Part II - Soft Frequency Reuse

To achieve effective performance and mobility careful radio planning needs to be performed. Since LTE is very flexible, i.e. it can be deployed in various frequency bands using a mixture of channel bandwidths, the actual planning decision is based on various factors, some of which are illustrated in the diagram.

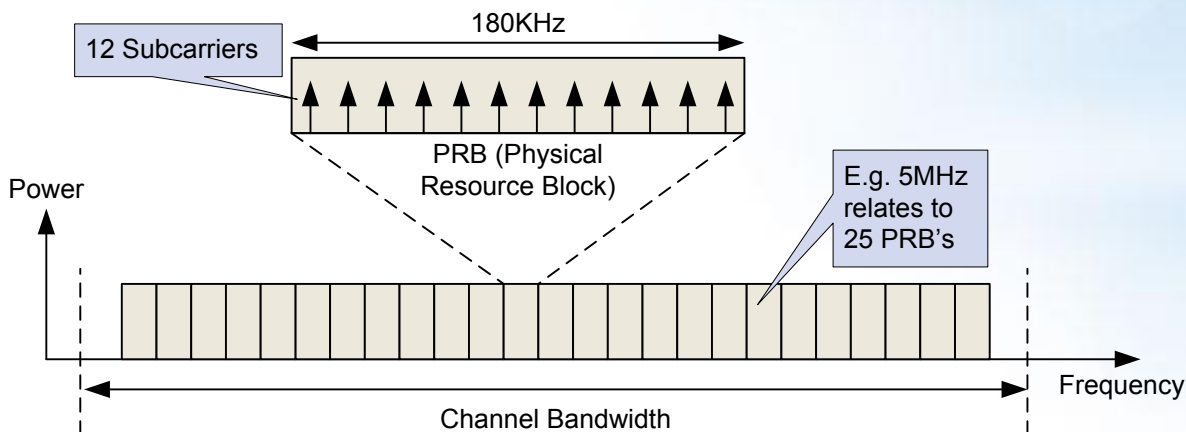


Cell Planning

The typical deployment will be based on a three sector site. This is apparent due to historic frequency planning methods, vendor implementation and also the fact that allocation of the LTE PCI (Physical Cell Identifier) includes a Cell_{ID}⁽¹⁾ (Cell Identity Group Number) and Cell_{ID}⁽²⁾ a (Cell Identity Number), the latter is encoded as 0, 1, or 2 to reflect one of the three sectors. There are also various scenarios when a two sectored site or an omni directional site would be implemented.

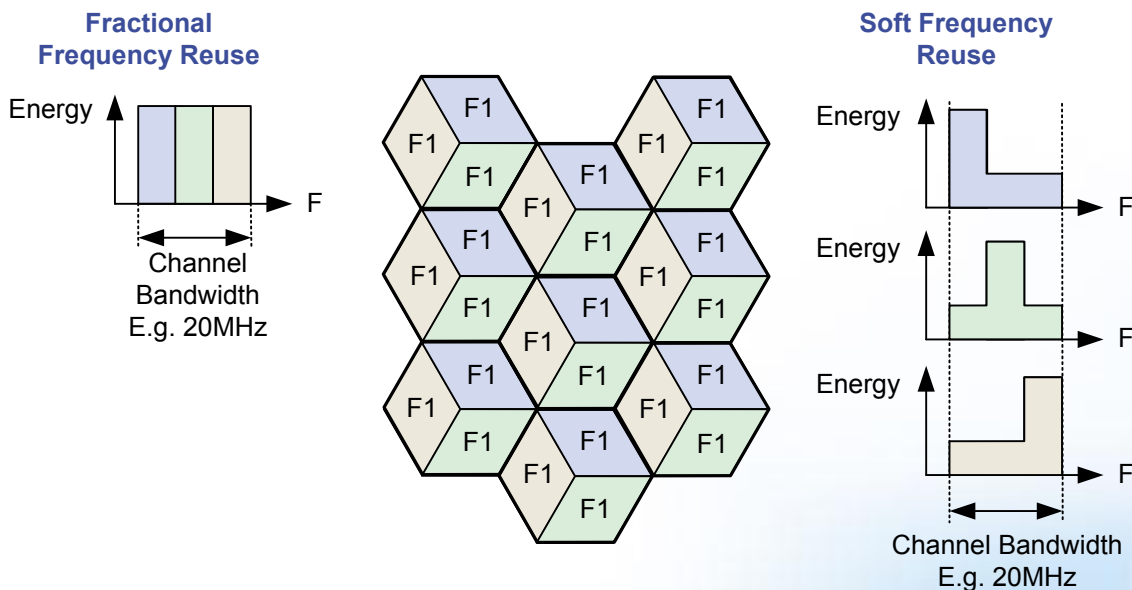
Frequency Reuse Schemes

In addition to standard frequency reuse, LTE radio planning can also employ SFR (Soft Frequency reuse). To explain the concept of SFR, it is first best to describe FFR (Fractional Frequency Reuse) and PFR (Partial Frequency Reuse) schemes. In LTE, OFDMA (Orthogonal Frequency Division Multiple Access) and SC-FDMA (Single Carrier - Frequency Division Multiple Access) are defined. These both utilize 15KHz subcarriers which are then grouped into PRB (Physical Resource Blocks), each containing 12 subcarriers equating to 180KHz of spectrum. The diagram illustrates this concept.

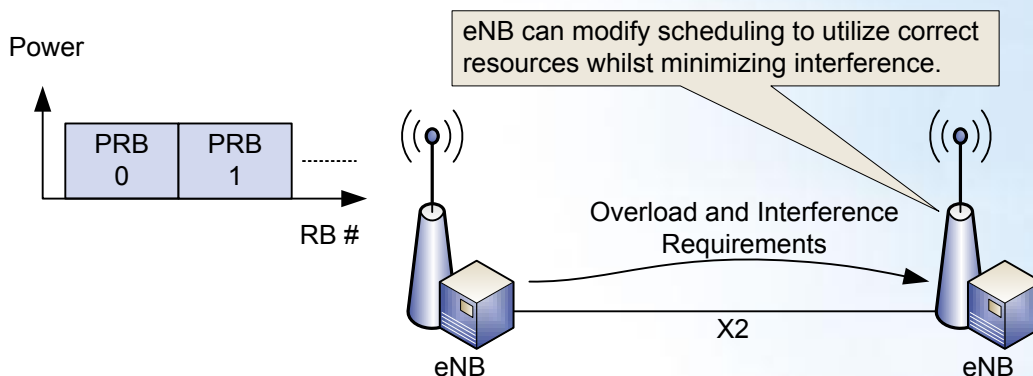


There are various options how these Physical Resource Blocks can be allocated, as well as implemented for FFR, PFR and SFR. Fractional and partial frequency reuse schemes are both fundamentally based on allocating a number of these PRBs in a sector. The main issue with these is that they limit the maximum throughput available to a user - since they are not able to allocate the full bandwidth.

In comparison, the concept of Soft Frequency Reuse enables the system to maximize the capacity of the network by enabling each sector to utilize the full bandwidth. To do this, SFR adjusts the power allocated to certain PRB's in order to mitigate ICI (Inter Cell Interference). It also enables the eNB to allocate the full bandwidth (all PRBs at a lower power) to users close to the cell, thereby achieving higher peak rates.



In addition, the LTE system includes ICIC (Inter-cell Interference Coordination) techniques which enable the eNB (Evolved Node B), via the X2 interface (eNB to eNB), to pass overload and high interference information. This in turn may be used by the eNB to dynamically adjust the number and power of PRBs allocated in a cell. This is implementation specific!



For further information on LTE Radio Planning or any other aspect of LTE operation, why not book your place now on one of our LTE courses?

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