MATLAB Based Femtocell Network Simulation

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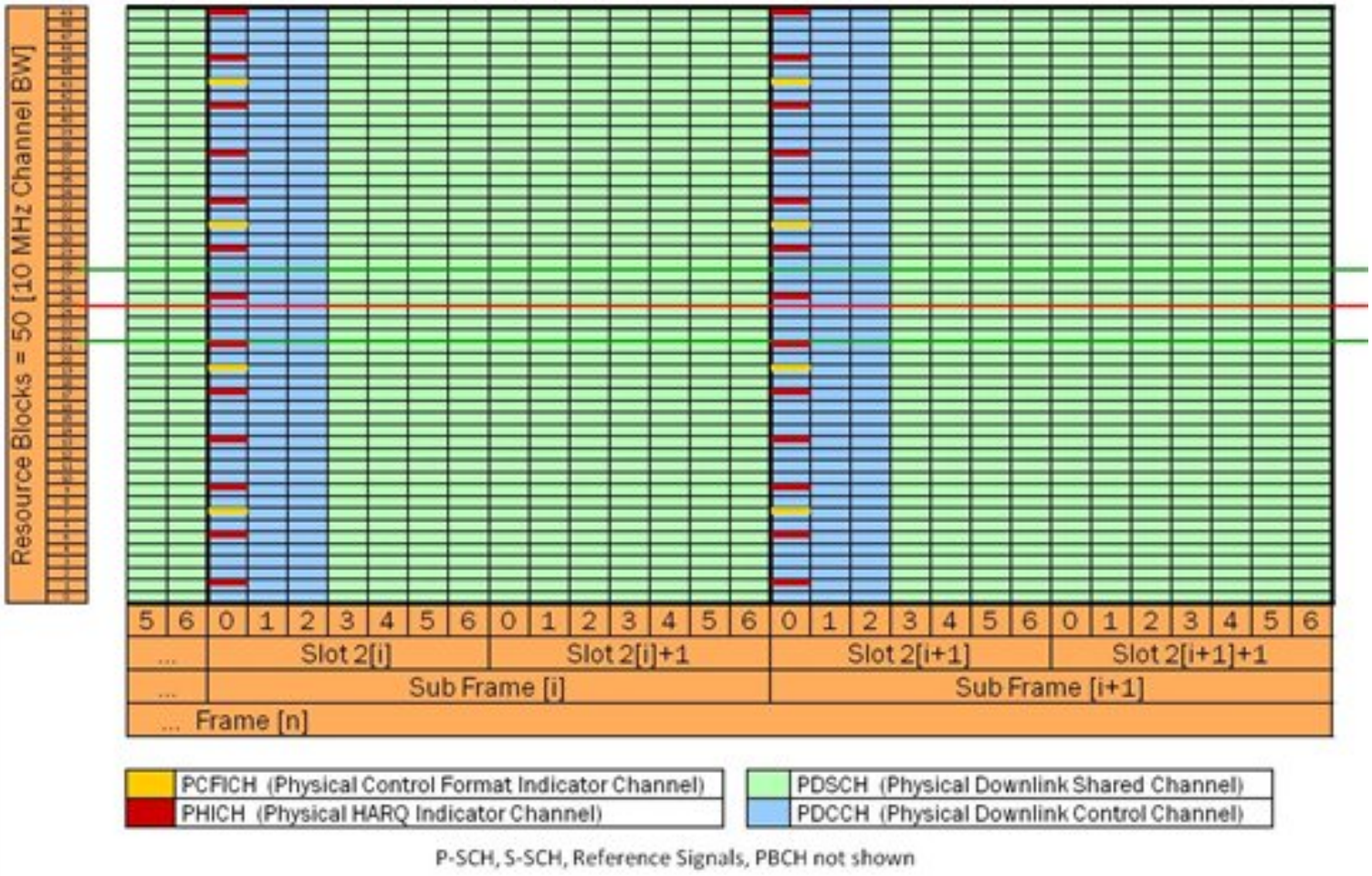
Overview

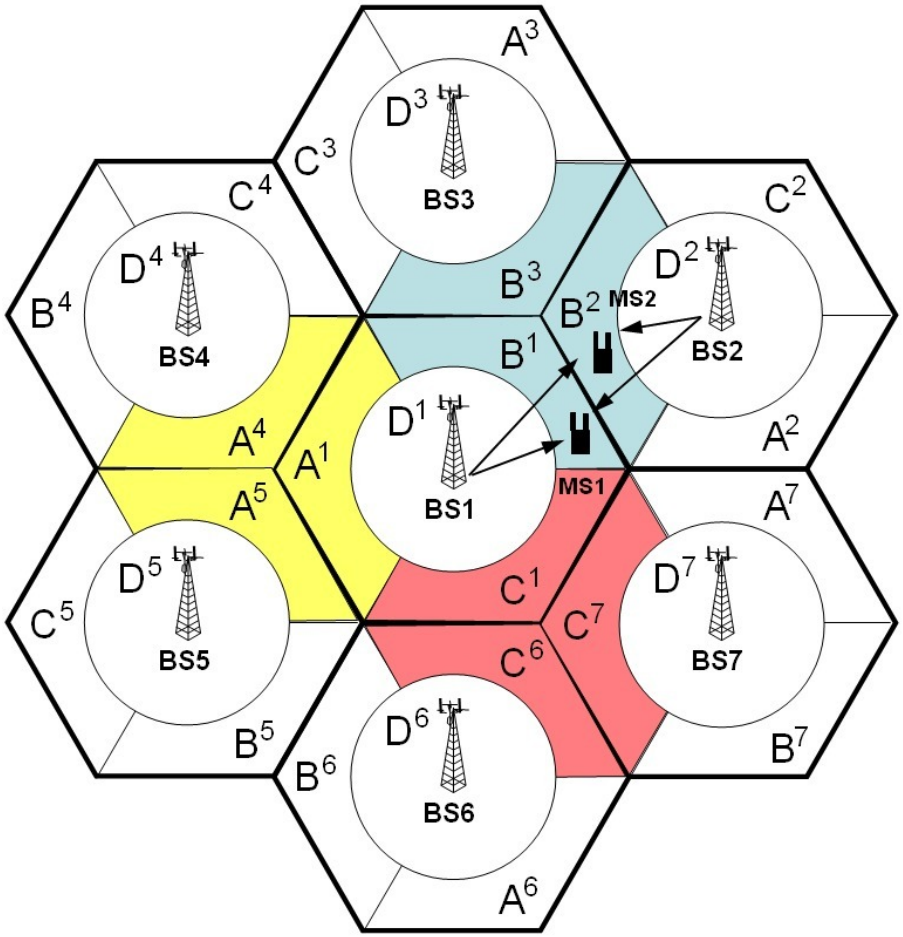
LTE Attributes/Features

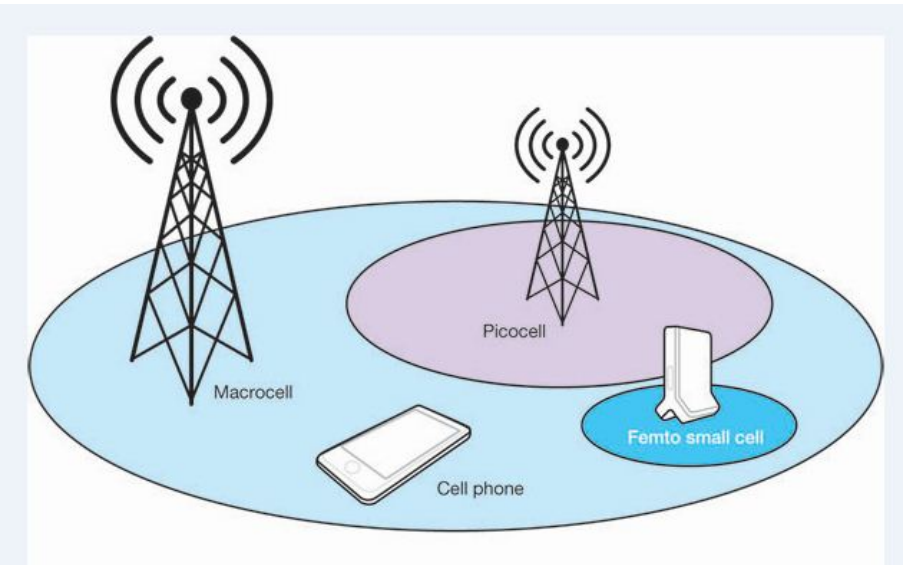
- LTE uses a fully scheduled MAC Layer (except for RACH)
- LTE comes in flavors of both TDD and FDD (FDD will be focused on since it can be simplier to evaluate and explain)
- Bandwidths from 1.4MHz to 20MHz
- Resource Blocks can be QPSK, 16QAM, 64QAM
- Turbocoding rates from 1/2 to 948/1024

Basic LTE Resource Allocation



Cell Topologies





Interference

Inter-cell (Among)

- ICIC (inter-cell interference coordination) is used to resource interference among overlapping edge users
- Uses coordination over X2 interface between eNodeB's to enforce scheduling rules

Intra-cell (Within)

- eICIC is still under development and only methods for Pico-cells have been standardized
- Femtocell interference is still an area of debate, but will most likely adopt strategies similar to ICIC
- Interference among Femtocells is still up for grabs

Overview

Working and Tobe Changed

Working

- Can simulate N Femtocells with M UE's associate with each cell
- Pathloss is based off WINNER Model (Current using indoor only models without walls)
- Resource blocks utilization is monitored simulation wide
- AP's can have custom positions
- Nodes can have customized tasks (aka VOIP, Web, etc...)

In progress

- Sensing is non-realistic
- AP's are assumed synchronized
- Scheduler needs to be more streamlined

Modeling Work

- Overall network throughput as nodes increase
- Interference characteristics
- User statistics
- Resource allocation modeling
- Smart scheduling
- Can sensing be done? Does it provide any advantage

Demo

References

- http://lteuniversity.com/get_trained/expert_opinion1/b/dhar/archive/2010/08/27/one-millisecond-in-the-life-of-an-lte-ue.aspx
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