

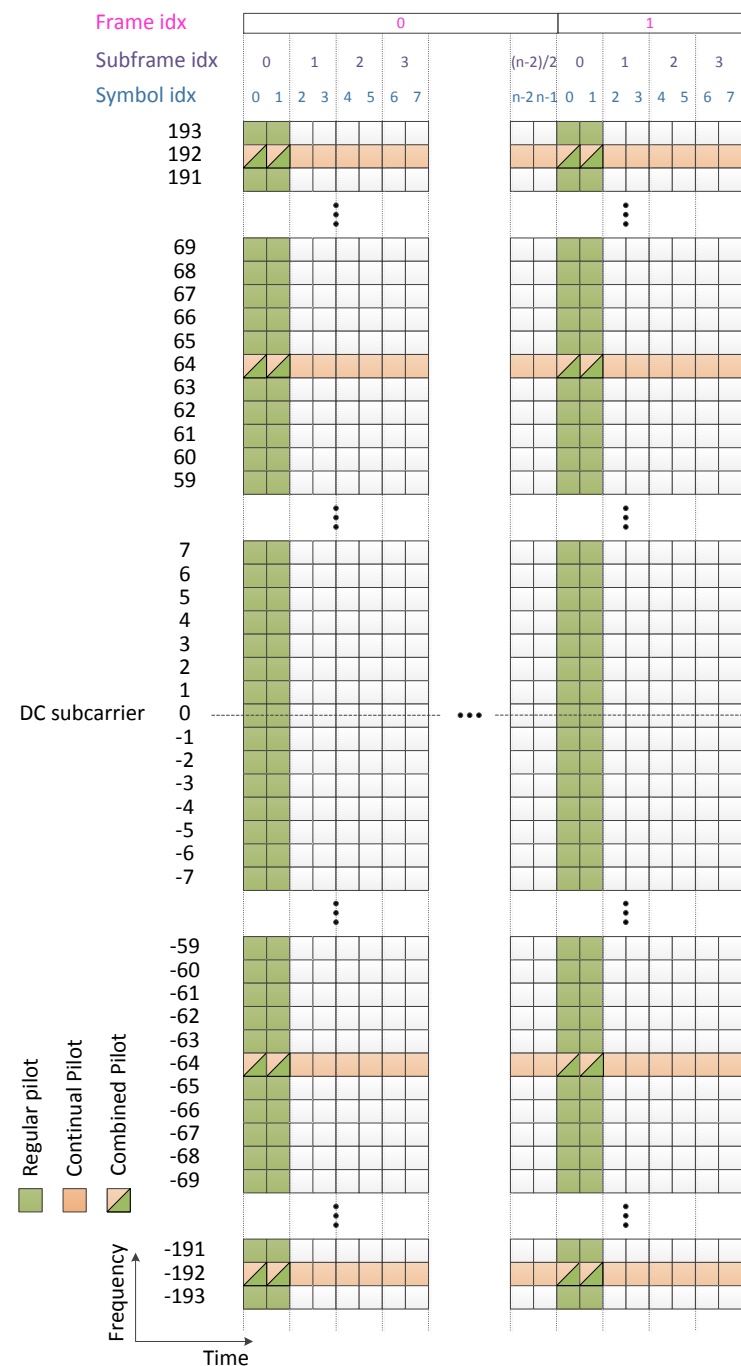
PHY Link Channel

PHY Acquisition Based on Continual Pilots

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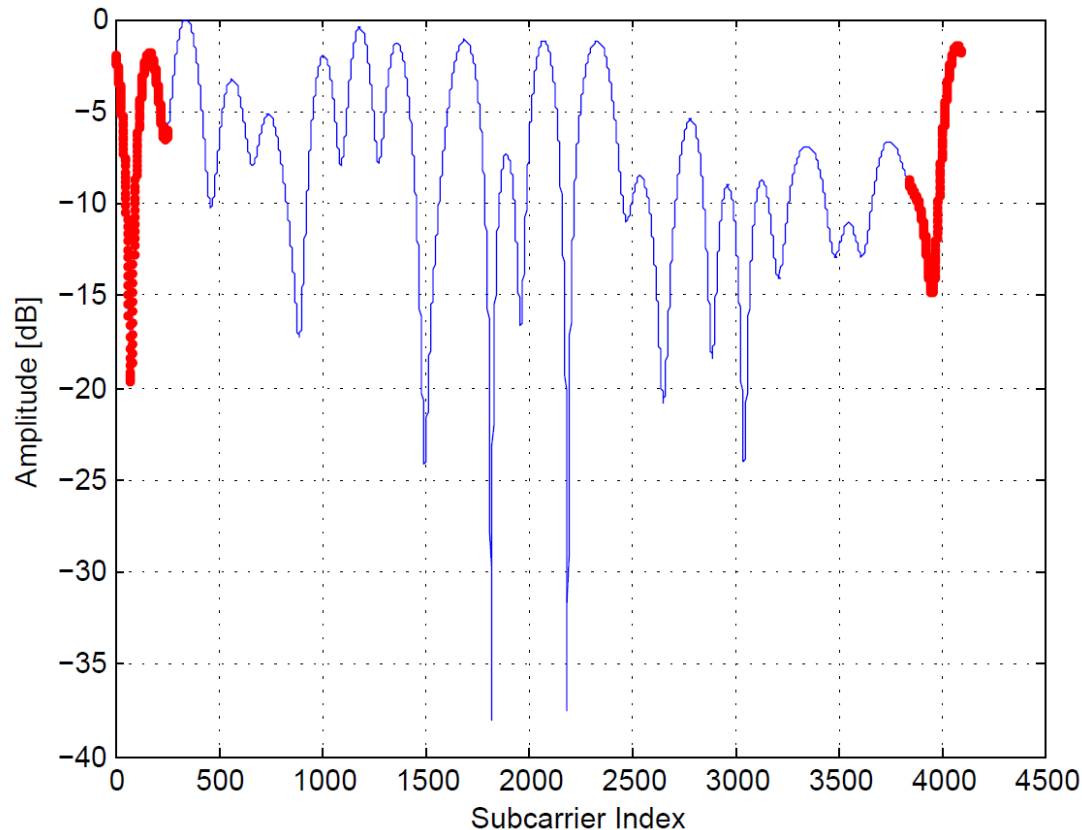
PHY Frame Structure

- Symmetric pilots around center subcarrier
- Regular pilot symbols:
 - One pilot symbol on every subcarrier (could be made configurable)
 - Two consecutive OFDM symbols with regular pilots. These two symbols define subframe 0.
 - Repetition of regular pilots every 128 subframes
 - Used to obtain a reliable one shot estimate of the channel response
- Continual pilots:
 - One pilot symbol on every 128 subcarriers
 - Used to track/update the channel estimate that was obtained from the regular pilots until a new full blown channel estimate becomes available
- Pilot overhead:
 - Regular pilots: 1/128
 - Continual pilots: 1/128
 - Combined pilot overhead: $1/64 = 1.56\%$



Simulation Results

- Consider the smallest available channel
 - 24MHz wide (512 subcarriers)
 - 4 continual pilots available for acquisition
- Randomly generated channel
 - Unrealistic (pessimistic analysis): >30dB dynamic range
 - **Used subcarriers**



Simulation Results

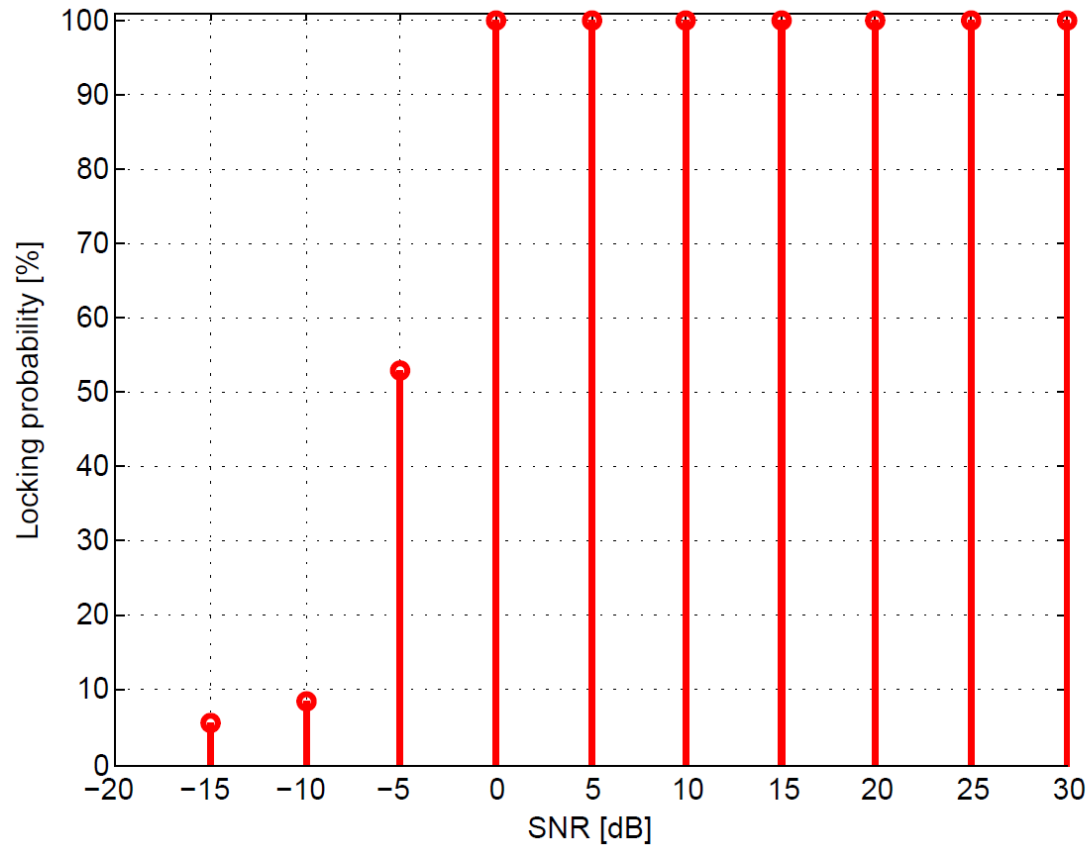
- Carrier Frequency Offset (CFO)
 - Integer CFO
 - Fractional CFO

$$CFO = k\Delta_{SC} + \delta$$

- Searcher operation:
 - Time domain
 - Perform fractional CFO estimation and correction
 - Frequency domain
 - Search for continual pilots (integer CFO estimation)
 - Re-estimate fractional CFO
 - Searcher processes **12 consecutive symbols**

Simulation Results

- Searcher operation:
 - Frequency domain
 - Search for continual pilots (**integer CFO** estimation)
- Success probability:



Simulation Results

- Searcher operation:
 - Time domain
 - Perform **fractional CFO** estimation and correction
 - Frequency domain
 - Re-estimate **fractional CFO**

