Single Carrier Transmission with Frequency Domain Equalization for High Speed Wireless Indoor Applications

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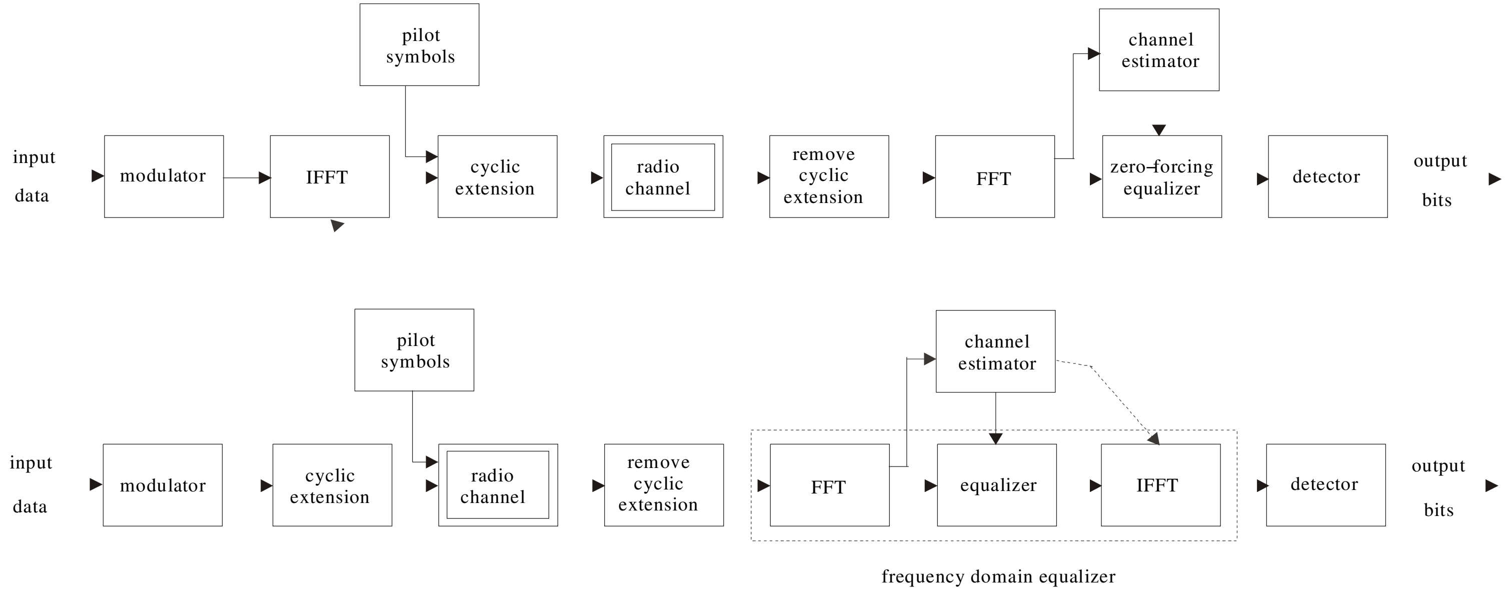
Present Status in High Data Rate Indoor Communications

- 2.45 GHz ISM Band
  - Standardization Bodies:
    - IEEE 802.11 (WLAN)
    - Bluetooth (wireless comm. between PCs and other digital equipment)
    - Home RF (cost effective wireless services for homes and small offices)
  - Modulation Techniques: DS– and FH–Spread Spectrum
- 5.15, 5.25, 5.725 U–NII GHz Bands
  - Standardization Bodies
    - ETSI: HIPERLAN/2 (WLAN)
    - IEEE 802.11 (WLAN)
  - Modulation Technique: **OFDM**

Important System Design Parameters

- Bandwidth efficiency
- Complexity of digital baseband signal processing
- Transmitter power efficiency
- Synchronization efforts
- BER performance
- Performance in the presence of carrier frequency offsets and phase noise
- Adjacent channel interference
- ...

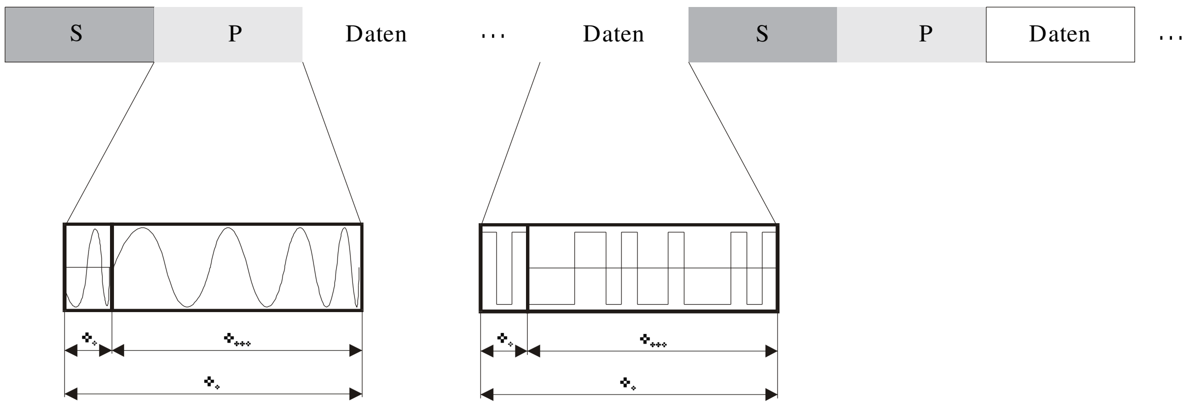
OFDM versus Single Carrier Transmission with Frequency Domain Equalization



above: OFDM transmission

below: Single carrier transmission with frequency domain equalization (SC/FDE)

Frame structure of SC/FDE



S...Pilot symbols for synchronisation

P...Pilot symbols for channel estimation

SC/FDE features

- Low baseband signal processing complexity
- Moderate envelope behavior of the transmitted signal

  compared to OFDM –> cost effective power amplifiers are applicable
- Infinite length equalizers are realizable in the frequency domain
- Optimum matched filter implementation is realizable

  in the frequency domain