Multipath Propagation

Scattering at the mobile:

- Local buildings cause reflections
- High Doppler spread due to mobile motion
- small scattering radius – small delay spread

Remote scattering:

- Dominant scatterers cause specular multipath with significant delay and angle spreads
- Time–varying multipath

Scattering at base:

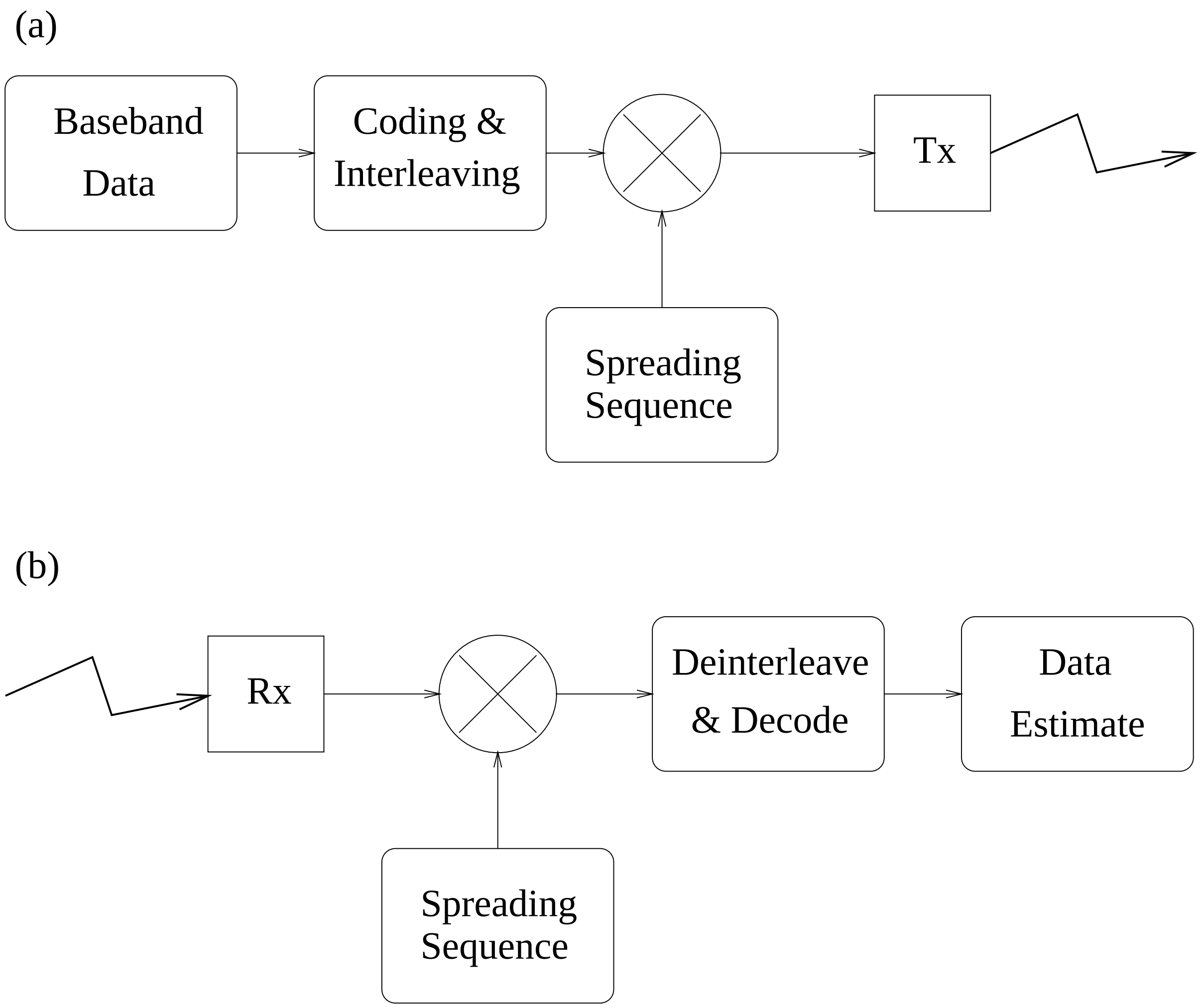
- Local buildings cause reflections
- Worse for low elevation angles
- Severe angle spread giving space–selective fades
- Generally time invariant fading

Typical Channel Characteristics

Environ–ment	Cell type	Delay spread	Angle spread	Doppler spread
Flat rural	Macro	0.5 μs	1°	190 Hz
Urban	Macro	5 μs	20°	120 Hz
Hilly	Macro	20 μs	30°	190 Hz
Dense urban	Micro	0.3 μs	120°	10 Hz
Indoor	Pico	0.1 μs	360°	5 Hz

Table of typical channel parameters (after Paulraj).

Code Division Multiple Access



(a) Generic DS-SS transmitter and
(b) receiver.