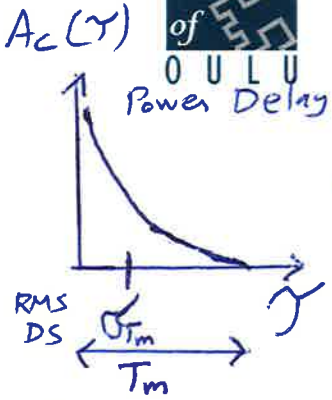
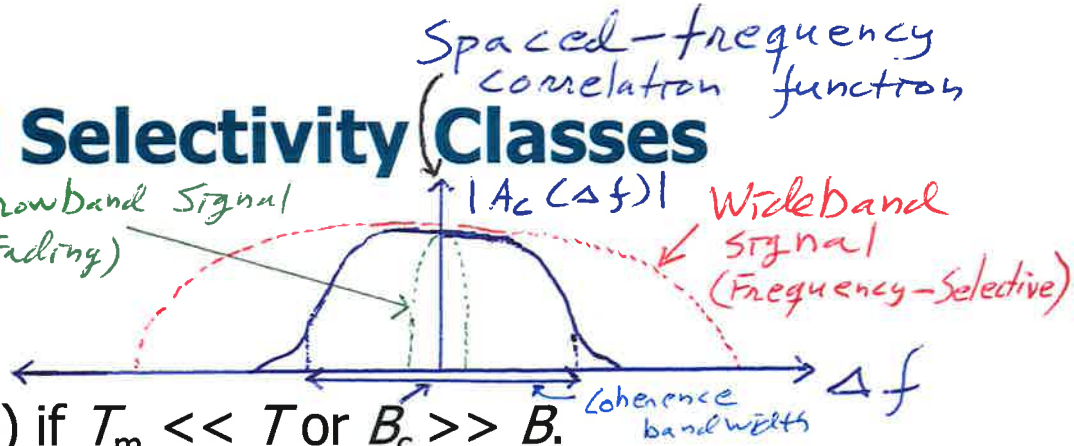
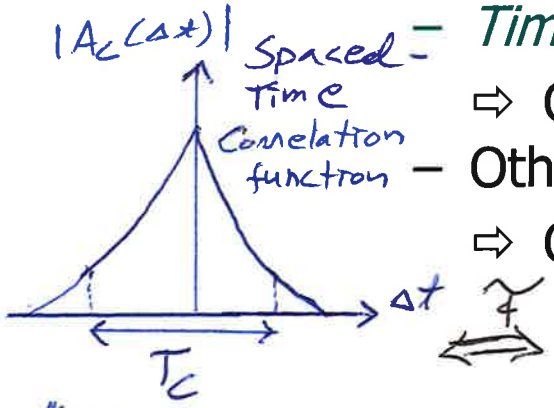
Summary of Channel Selectivity Classes



Delay Spread
Sklan: Maximum excess delay

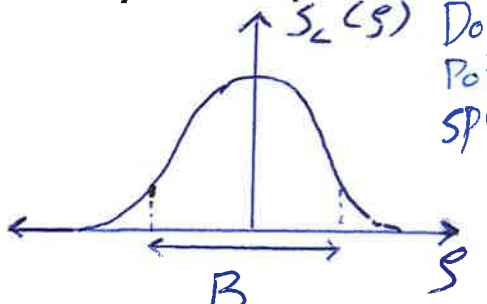


- **Frequency selectivity**
  - Frequency-flat (non-selective) if $T_m << T$ or $B_c >> B$.
    - ⇨ No frequency dispersion or intersymbol interference (ISI).
  - Otherwise frequency-selective.
    - ⇨ Frequency dispersion or intersymbol interference (ISI).
- **Time selectivity**
  - *Time-flat* or *slowly fading* if $T_c >> T$ or $B_d << B$.
    - ⇨ Channel approximately constant from symbol to symbol.
  - Otherwise time-selective or *fast fading*.
    - ⇨ Coherent communications may be impossible.



Coherence Time

$$B_D \approx f_{D\max}$$



Doppler spread
$B_D \triangleq \frac{v}{\lambda} = f_D$

f_D is Spectral Broadening

"what is the correlation between received signals, that are spaced in frequency $\Delta f = f_1 - f_2$?"

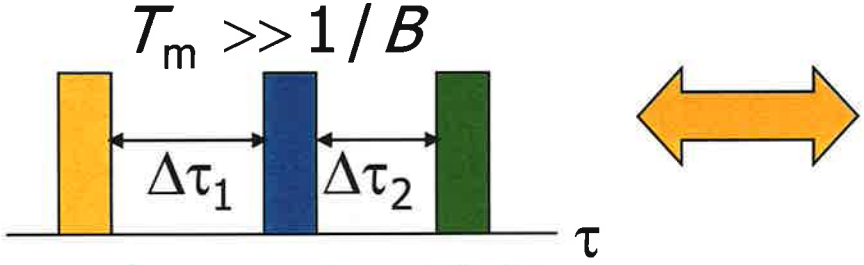
Summary of Channel Parameters

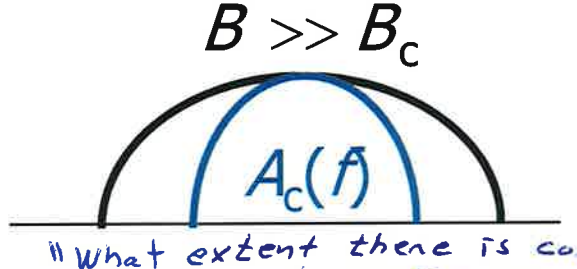
Popular approximations

Sklar: $B_c \approx \frac{1}{5\sigma_{T_m}}$ (correlation ≥ 0.5)

- **Frequency selectivity measures**
  - Multipath or delay spread T_m.
  - Coherence bandwidth $B_c \approx 1/T_m$.

Range of frequencies over which the channel passes all spectral components with app. equal gain and linear phase.





"What extent there is correlation between the channel's responses to a sinusoids sent at time t_1 and t_2 where $\Delta t = t_2 - t_1$?"

- **Time selectivity measures**
  - Doppler spread B_d: the maximum Doppler frequency for which $S_c(\rho) \geq 0$.
  - Coherence time $T_c \approx 1/B_d$.

Sklar: $T_C \approx \frac{\lambda/2}{v} = \frac{0.5}{B_D}$

T_c is a measure of the expected TIME duration over which the channel's response is essentially invariant.