E 5.1

A mobile telephone is moving in a city environment.

i) The received signal is exposed to a Rayleigh multipath fading. What is the minimum required fading margin (in dB) to make the channel available with a 95% probability?

ii) The signal is now, in addition to the multipath fading, also exposed to shadow fading with a (log-) standard deviation of 4 dB. Assume that the total fade margin can be derived by summing the fade margins for the Rayleigh fading and the shadow fading processes. What is the new minimum required fading margin (in dB) to make the channel available with 95% probability.

E 5.2

A Rayleigh fading radio channel has a delay spread of T_m=1 ms and a Doppler spread B_d = 10 Hz. The signalling bandwidth is 25 kHz.

i) Estimate the coherence bandwidth and the coherence time of the channel.

ii) Is this channel frequency selective

ii) Are we dealing with slowly fading channels?

E 5.3

A local spatial average of a power delay profile is shown in Figure 5.1

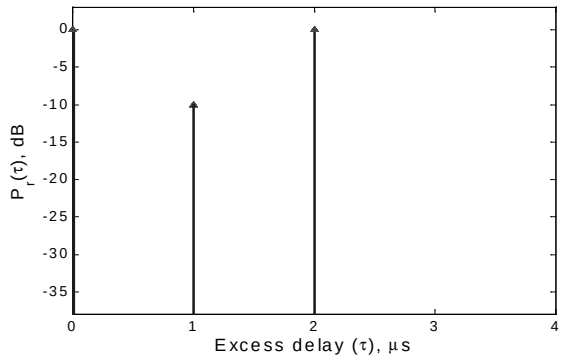

Figure 5.1 Power delay profile

i) Determine the rms delay spread and mean excess delay for the channel.

ii) Determine the maximum excess delay (20 dB).

iii) Determine the maximum RF symbol rate if the symbol duration T is less that 10σ, where σ is RMS delay spread, an ISI takes place.

iv) If the mobile travelling at 30 Km/hr receives a signal through the channel, determine the time over which the channel appears stationary.

Homework-5 Deadline 04 March 2002 at 10.00

Homework return box is located at Otakaari 5, 2nd floor, near the E-wing. You can also return the answers to the assistant just before the class.

If a particular modulation provides suitable BER performance whenever $\sigma/T_s \leq 0.1$, determine the smallest symbol period T_s (and thus the greatest symbol rate) that may be sent through the indoor and outdoor RF channels shown in Figure 5.2 The received power is in dB.

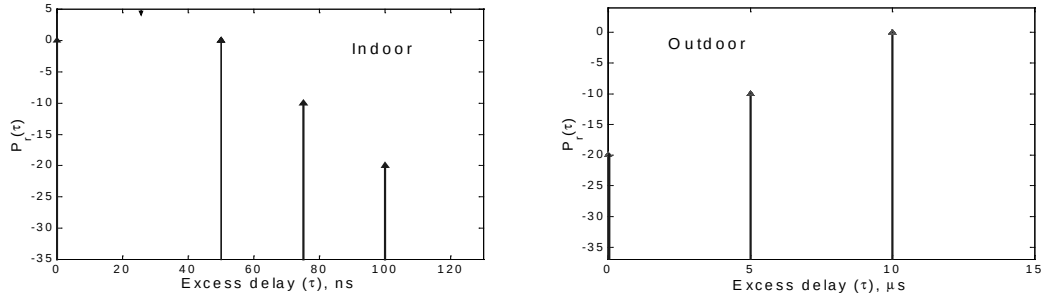

Figure 5.2