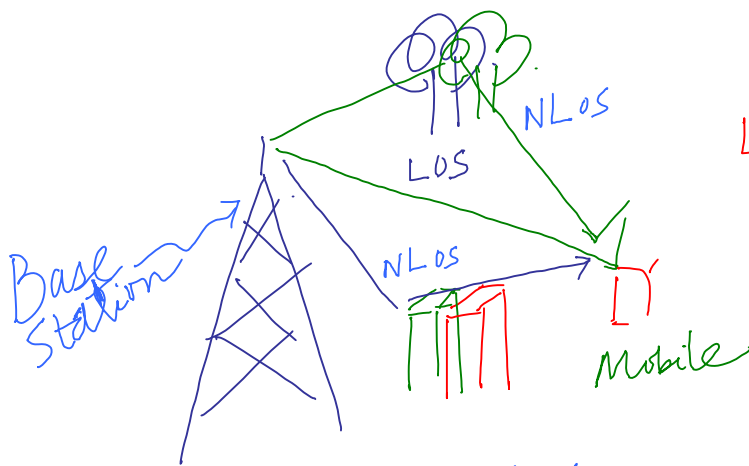


Wireless Channel

How does wireless channel
affect { wireless comm?

Characterize
wireless channel.



LOS = Line of Sight
or Straight Line
Path

NLOS = Non Line of Sight
Scatter Path

Channel Response

$$h(t) = \sum_{i=0}^{L-1} a_i \delta(t - \tau_i)$$

Delay of i^{th} path.

attenuation of i^{th} path

L = number of Multipath components.

Power Profile:

$$\phi(t) = \sum_{i=0}^{L-1} |a_i|^2 \delta(t - \tau_i)$$

↑
Power of i^{th}
Multipath component

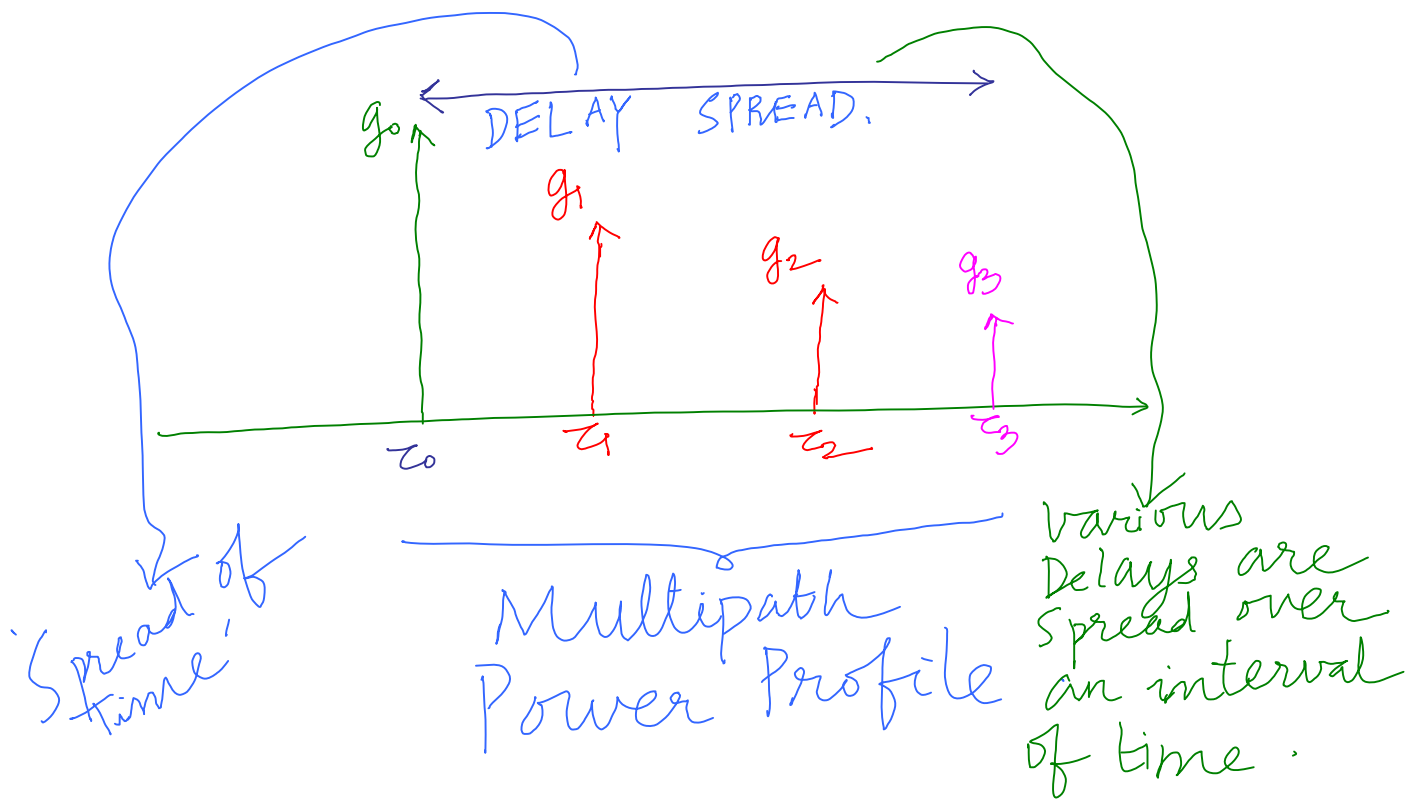
$$= \sum_{i=0}^{L-1} g_i \delta(t - \tau_i)$$

where $g_i = |a_i|^2$
↑
GAIN of i^{th} path

Example: Consider an $L = 4$ multipath channel.

$$h(t) = \sum_{i=0}^3 g_i \delta(t - \tau_i)$$

gain	delay
$g_0 = a_0 ^2$	τ_0
$g_1 = a_1 ^2$	τ_1
$g_2 = a_2 ^2$	τ_2
$g_3 = a_3 ^2$	τ_3



How to characterize the delay spread?

First arriving component τ_0 .

Last arriving component τ_{L-1}

$$\sigma_{\tau}^{\max} = \tau_{L-1} - \tau_0.$$

Maximum Delay Spread.

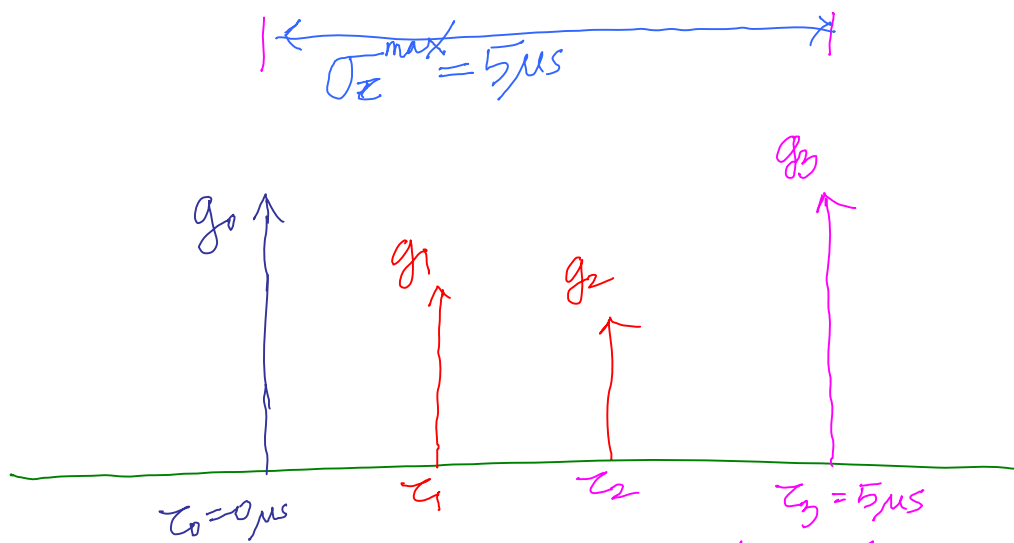
Example: consider a multipath channel with $L = 4$ components.

$$\tau_0 = 0 \mu s$$

$$\tau_3 = 5 \mu s$$

$$\sigma_{\tau}^{\max} = \tau_3 - \tau_0 = 5 - 0$$

$$\boxed{\sigma_t^{\max} = 5 \mu s.}$$



MAXIMUM Delay Spread.

$\sigma_{\tau}^{\max} = 5\mu s$

Delay between first and last arriving components