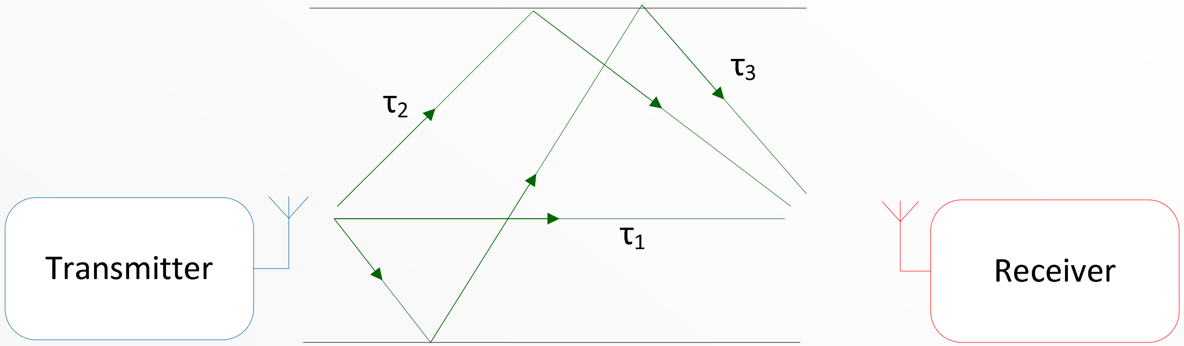
ULB

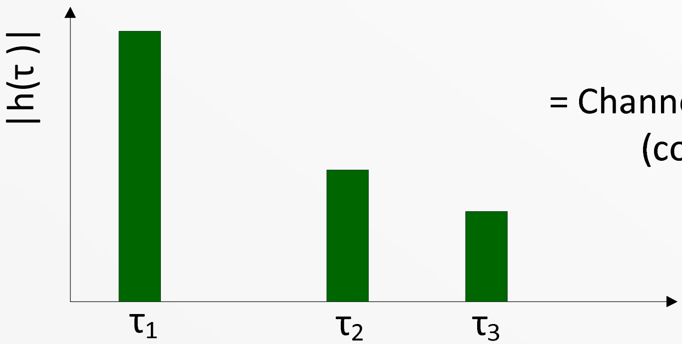
WIRELESS COMMUNICATIONS
RESEARCH GROUP

OPERA.ULB.AC.BE

Conception of a complete OFDM communication channel

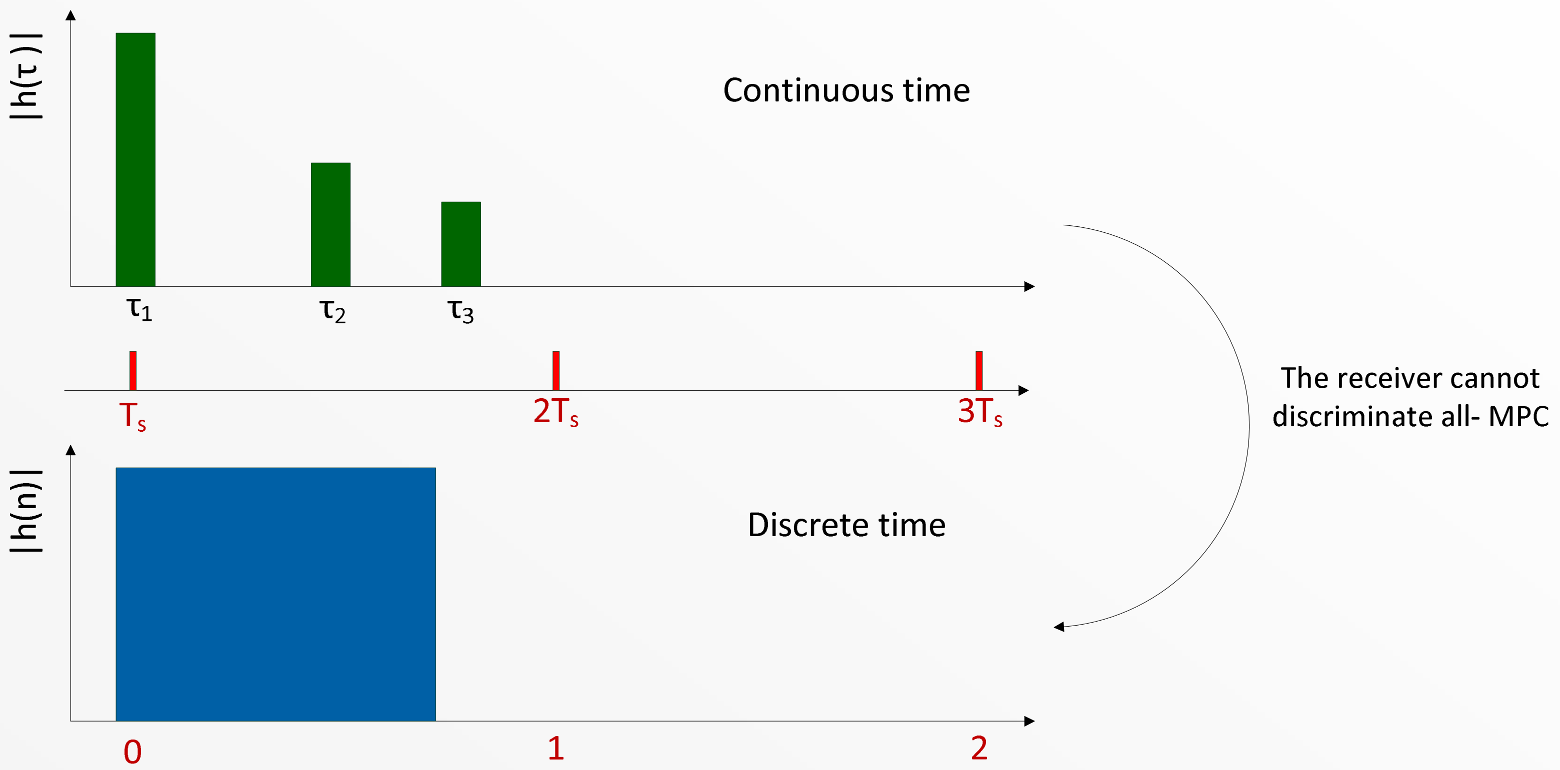
Multi-Path Components



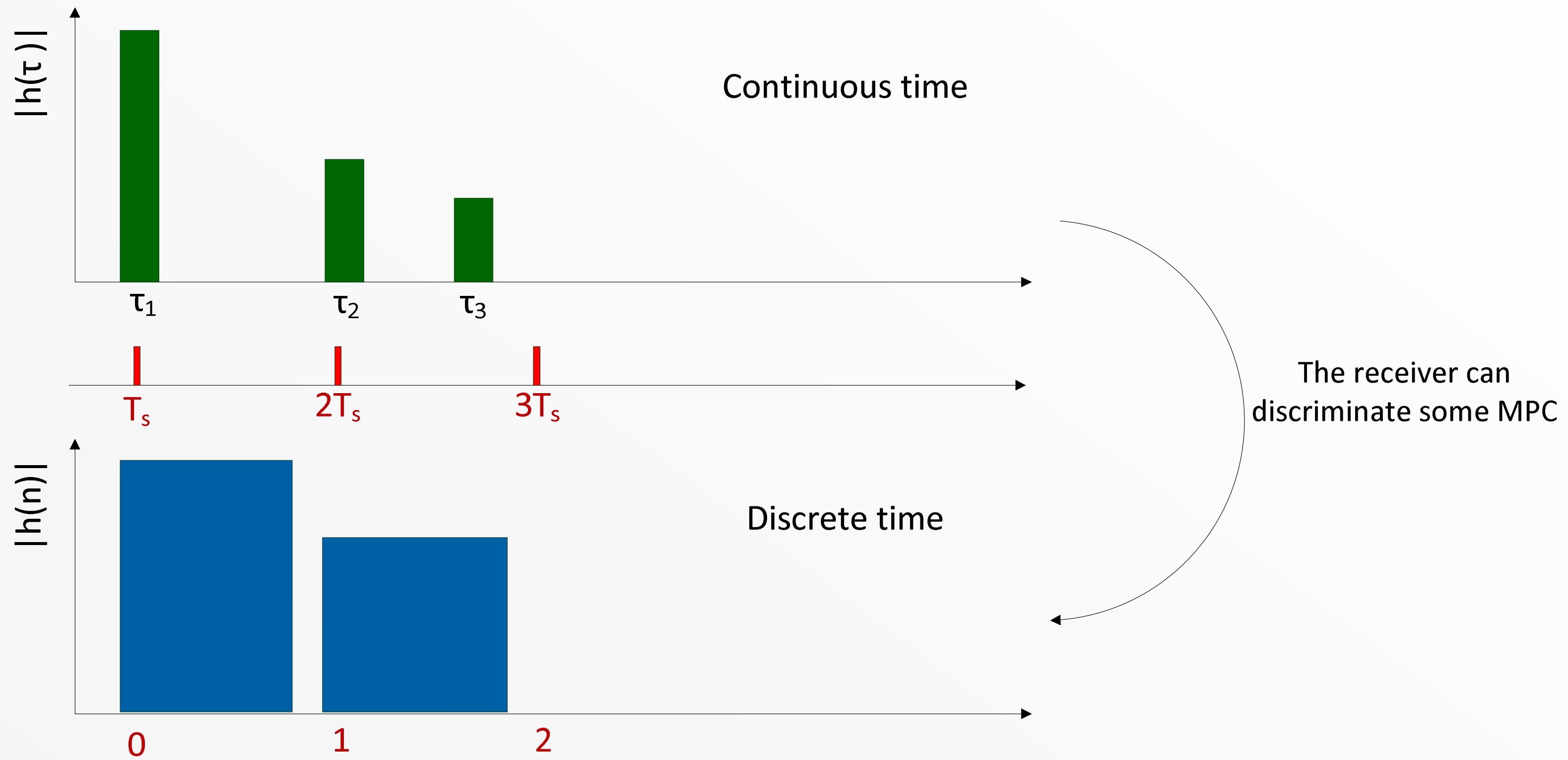


= Channel impulse response
(contiuous time)

Narrowband: Sampling period $T_s > \tau_3$

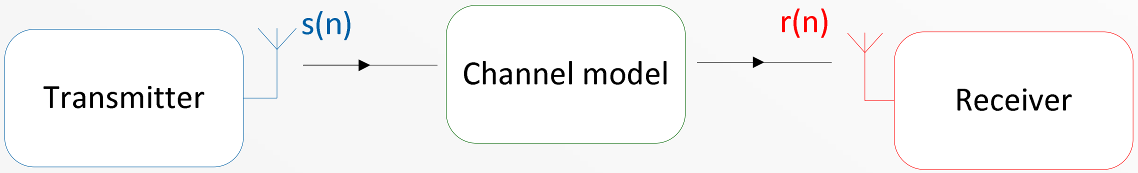


Wideband: Sampling period $T_s < \tau_3$



Channel model

- Evaluate the parameters which characterize the propagation channel
- Define the physical properties of the channel
- Easier to share than measurement files
- Used to test communication algorithms



Statistical channel model

- The exact value of the impulse response depends on the receiver and transmitter position but also on the IO's positions
- All these parameters can change during time
- A model which takes all these parameters into account is too complex to be used
- A statistical model is more suitable

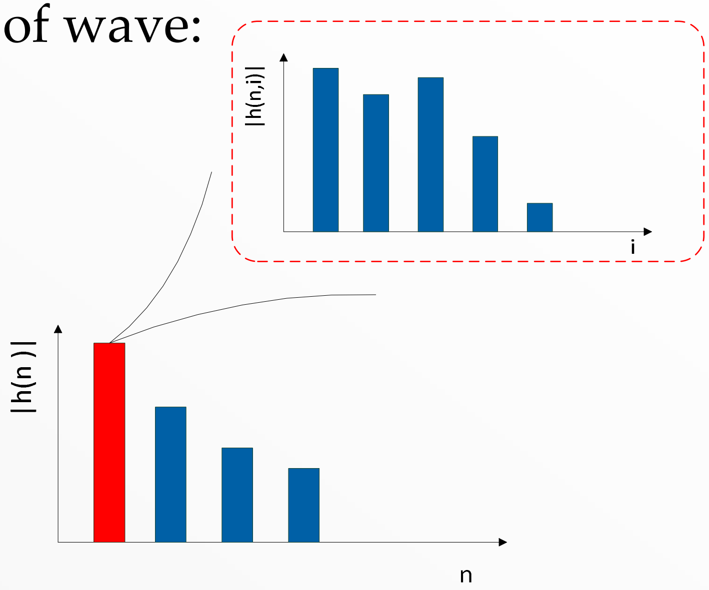
Statistical channel model

- Each tap is composed by bunches of wave:

$$h(n) = \sum_i h(n,i)$$

where

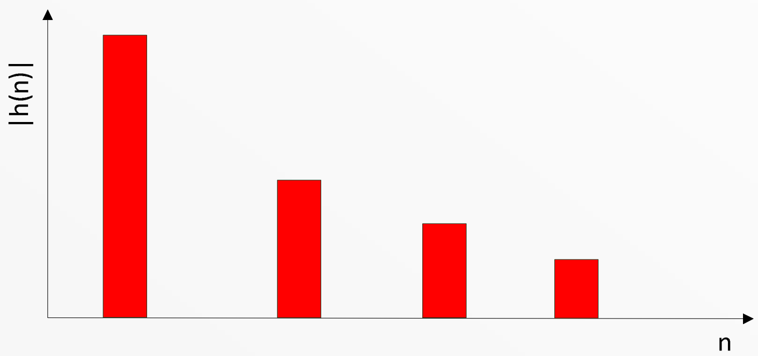
- $h(n,i) = a_i e^{j\Phi_i}$
- $\Phi_i = \phi_i - \vec{\beta}_i \vec{r}_i$



- $\arg(h(n))$ is a random value with constant distribution between 0 and 2π
- |h(n)| follows a Rice or a Rayleigh distribution

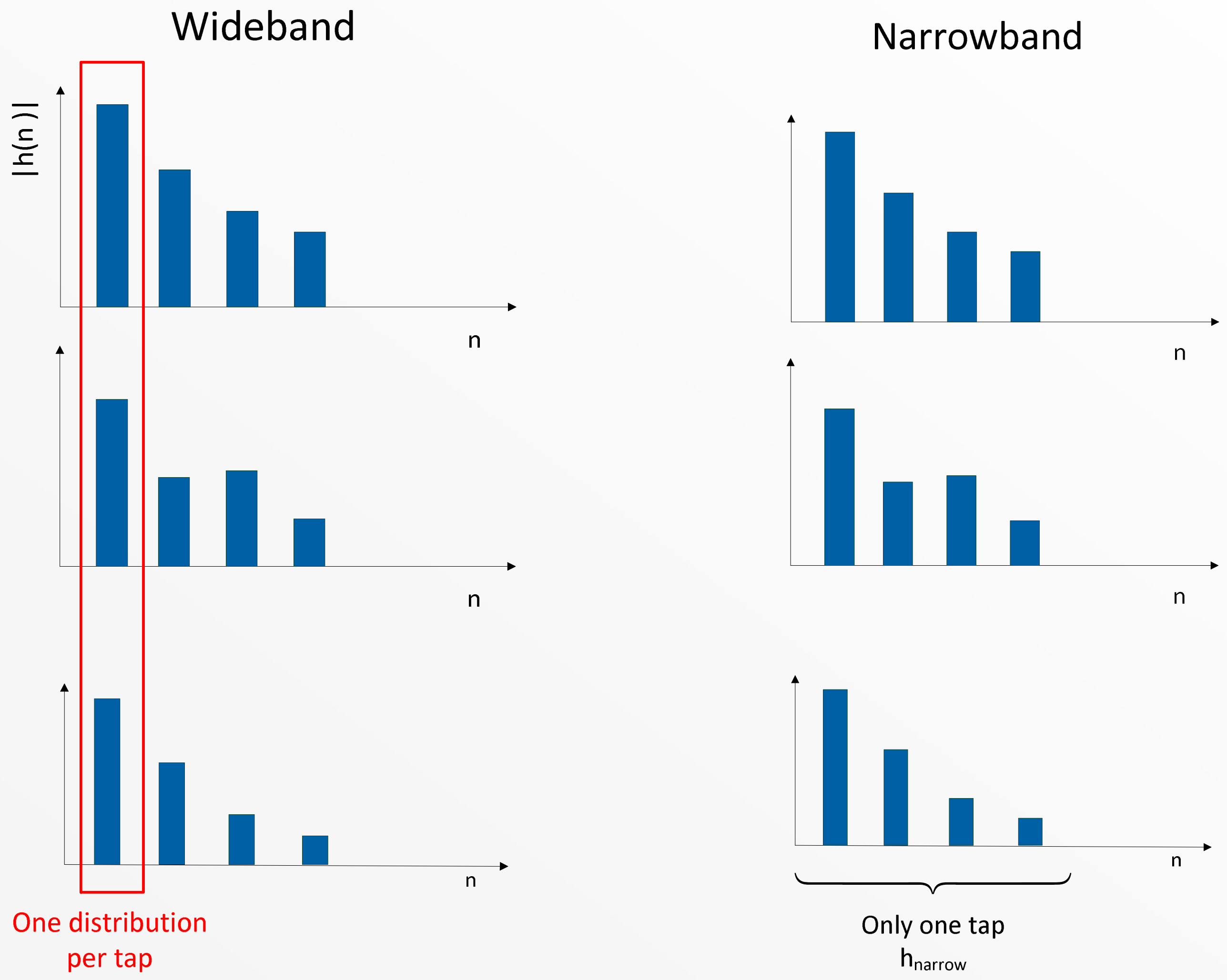
Wideband and Narrowband channel

- In wideband, the receiver can discriminate the MPC's
- In narrowband, all the MPC's are observed as on bunch of wave:



$$h_{narrow} = \sum_{n} h(n)$$

Wideband and Narrowband channel



Objective

- For both LOS and NLOS scenarios, using the dfittool,
  - Construct a narrowband channel and characterize its distribution
  - In wideband (20 MHz), characterize the distribution of each tap
  - Using those characteristics, build a statistical narrowband and wideband channel model