

1 Theory, assumed state of knowledgeTheory, assumed state of knowledge

Lecture (CE II/Script): Chapters 5; Fading, time-varying channels

2 What is shown?

A time-varying two-path channel is the basis for this demo. The first path is an ideal path, the second is delayed by 0.3 ms and has a doppler shift of 0.3 Hz.

You can have a look at the magnitude of the *time-variant transfer function* $H(f, t)$ in the time-frequency-plane and you can hear the output signal of the channel for the following input signals:

- a pure tone (cos)
- a music signal
- a noise signal.

The spectra of the signals at the input of the channel are limited to the frequency range 300 Hz to 3 kHz. You can listen to the audio signals to get an impression of the time-varying channel. Additionally the absolute values of the transfer function in it's dependence of time can be seen in two separate diagrams. One shows the transfer function in the equivalent lowpass domain and the other shows it in the bandpass domain.

3 What is demonstrated?

The intention of this demo is to deepen the topic *time-variant channels* and *frequency-selective fading* by examples with the help of acoustical impressions. For music signals, but especially for white noise at the input of the channel, the time-varying frequency-selective fadings can be noticed clearly. The periodic time-variance of the channel leads to a periodic fading at different frequencies. The zero of the channel transfer function moves periodically through the time-frequency plane.