Vienna 5G Link Level Simulator v1.1 - List of Features

General Functionality

The Vienna 5G Link Level Simulator evaluates the average PHY layer performance by means of Monte Carlo simulations.

- no network geometry, no path loss model
- average user SINR is an input parameter
- simulate almost any multicarrier system
- choose parameters individually for each node

Channels and Links

Currently a FDD fame structure is implemented.

- Uplink data channel
- Downlink data channel

Channel Coding

Different channel coding schemes may be chosen for different cells to investigate their co-existence.

- Turbo coding
- TB convolutional coding
- Polar coding
- LDPC coding

Feedback

Quantized feedback to adapt the transmission parameters to the channel conditions.

- CQI, RI and PMI feedback selectable
- user defined or LTE-A compliant codebook
- variable feedback delay (in multiples of the frame duration)

Channel Models	
Doubly-fading channel model	• time selectivity via sum of sinusoids (Jakes) • frequency selectivity via tap delay models (pedestrian, vehicular, etc.) • spatial correlation via Kronecker model • TDL models with adjustable RMS delay spread • correlated time selectivity via sum of sinusoids • TWDP and Rican fading for static channels
Channel Estimation	
Pilot based channel estimation	• LTE like, rectangular or diamond shaped pilot patterns • LS channel estimation • perfect channel knowledge
Transmission Modes	
MIMO modes	• transmit diversity • receive diversity • open loop spatial multiplexing • closed loop spatial multiplexing
Non-orthogonal multiple access	• 3GPP MUST

Modulation

Different modulation schemes and waveforms may be chosen for different cells to investigate their coexistence.

- OFDM
- f-OFDM
- WOLA
- FBMC
- UFMC

Equalization and Detection

One-tap equalization with MIMO detection schemes

- Zero-Forcing
- MMSE
- Sphere Decoder
- Maximum likelihood

Power Amplifier Models

Non-linear power amplifier models for downlink transmissions

- Rapp model
- adjustable amplifier back-off

Performance Evaluation

Simulation results for up- and downlink:

- throughput per user
- coded and uncoded Bit Error Ratio
- Frame Error Ratio
- channel estimation MSE
- transmit signal peak-to-average power ratio