

Vienna LTE-A System Level Simulator v2.0

Q3-2018

List of Features

PERFORMANCE METRICS

User Equipment (UE) Specific or Cell Specific

- Average throughput (peak, mean, edge)
- Average spectral efficiency
- Bit Error Ratio (BER), Frame Error Ratio (FER) (coded / uncoded)
- Wideband Signal to Interference and Noise Ratio (SINR)

Cell Specific

- Fairness

SIMULATION PARAMETERS FOR CONFIGURATION

General Parameters

- Frequency
- Bandwidth
- Number of transmit- and receive antennas
- Planar antenna array structure
 - Number of antenna ports
 - Number of antenna elements per port (vertical direction)
 - Antenna element spacing in horizontal and vertical direction
 - Polarization type and slant angle
- Planar antenna array with panel structure
 - Number of panels in horizontal and vertical dimension
 - Number of antenna elements within the panel
 - Different port mapping schemes
 - Polarization types
- Transmission mode
 - 1) Single antenna
 - 2) Transmission Diversity (TxD)
 - 3) Open Loop Spatial Multiplexing (OLSM), Spatial Multiplexing with Cyclic Delay Diversity (CDD)
 - 4) Closed Loop Spatial Multiplexing (CLSM)
 - 5) Multiuser-MIMO
 - 6) Rank-1 CLSM
 - 7) Beamforming
 - 9) Eight Layer Spatial Multiplexing
- Carrier aggregation

Network Layout and Macroscopic Path Loss Parameters

- Generated Network
 - Network Geometry
 - * Regular hexagonal grid with fixed inter-eNodeB distance
 - * Stochastic eNodeB distribution with spatial density
 - * Hybrid spatial distribution with deterministic- and random parts
 - * Predefined eNodeB locations
 - Map resolution in meters/pixel
 - Number of eNodeB tiers

- eNodeB transmit power
- Minimum coupling loss
- Macroscopic path loss models
 - * Free space
 - * Cost 231
 - * TS 36.942
 - * TS 25.814
 - * TR 36.873
 - * TR 38.900
 - * TR 38.901
- Exported data from Capesso™ planning tool
- Fixed path losses
- Small cell deployments
 - Spatial distribution of the femtocells
 - Transmit power of femtocells
 - Pathloss model for indoor propagation

Shadow Fading

- Claussen: 2-D correlated lognormal-distribution
- None

Small Scale Fading

- Based on Power Delay Profile (PDP)
 - ITU Pedestrian A- and B channel
 - Extended Pedestrian B channel
 - ITU Vehicular A- and B channel
 - Winner II+ based channel model
 - Length of the channel trace
 - Fading correlation
 - Pregenerated fading
- Spatial channel model based on PDP and Angular Profile (AP)
 - 3GPP 3D channel model as referred from TR 36.873
 - 3GPP channel model for millimeter-wave as referred from TR 38.900
 - Interface for QuaDRiGa channel model (supporting both TR 36.873 and TR 38.900)

UE Settings

- Spatial distribution of UEs
- Speed of UE movement
- Receiver noise figure and thermal noise density

eNodeB Settings

- Maximum antenna gain
- Antenna gain pattern
 - Omnidirectional
 - Berger
 - TR 36.873 antenna element gain pattern
 - TS 36.942 (2-D and 3-D)
 - Six-sector antenna
 - Kathrein TS-antenna

Scheduler Settings

- Round Robin
- Best Channel Quality Indicator (CQI)
- Proportional fair
- Fractional Frequency Reuse (FFR) scheduler
 - Independent specification of Full Reuse (FR) and Partial Reuse (PR) scheduler.
 - Ratio of total system bandwidth, used for FR/PR.
 - SINR threshold
- Round Robin Multiuser-MIMO (MU-MIMO)

Uplink Channel Options

- Delay of feedback channel
- Quantized or unquantized CQI feedback

Coordinated Multipoint (CoMP)

- Coordinated Scheduling (CS) and Coordinated Beamforming (CB)
- Control entity `CoMP_site`
- CoMP scheduler

SINR Averaging Methods

- Mutual Information Effective Signal to Interference and Noise Ratio Mapping (MIESM)

*CQI Mapping Options**Random Number Generation Options**Simulation Time*

- Length of simulation in Transmission Time Intervals (TTIs)

Cache Options

- Cache network
- Cache UE positions

PRECONFIGURED SETUPS

- Omnidirectional eNodeBs
- Three sectors per eNodeB {Single-Input Single-Output (SISO), Multiple-Input Multiple-Output (MIMO) 4x2, MIMO 4x4}
- Three sectors scenario with femtocell overlay
- Three sectors per eNodeB for 3GPP 3-dimensional (3D) channel model
- Six sectors per eNodeB
- Network layout with Capesso data
- Files for reproducibility of published results

EVALUATION OF RESULTS

Saving of Results

- Aggregate result file

Debug and Plotting Options

- No output
- Basic output
 - eNodeB and UE positions
 - Throughput and aggregate results of selectable UEs and eNodeBs.
- Extended output
 - Debug plots including sector assignment, path loss maps, etc.