

# MIMO Measurements in a Micro Cell

## Measurement Setup:

- Propagation situation: non-line-of-sight, Tx antenna moved at walking speed, Rx antenna fixed
- Place: Campus of Ilmenau Technical University (large courtyard)
- Carrier frequency: 5.2 GHz, bandwidth: 120 MHz, maximum excess delay 3.2  $\mu$ s, transmitter power: 27 dBm



### Transmit antenna:

omnidirectional 16 element uniform circular array (UCA), vertical polarization

element separation:  $0.38 \lambda$   
height above ground: ca. 1.2 m



### Receive antenna:

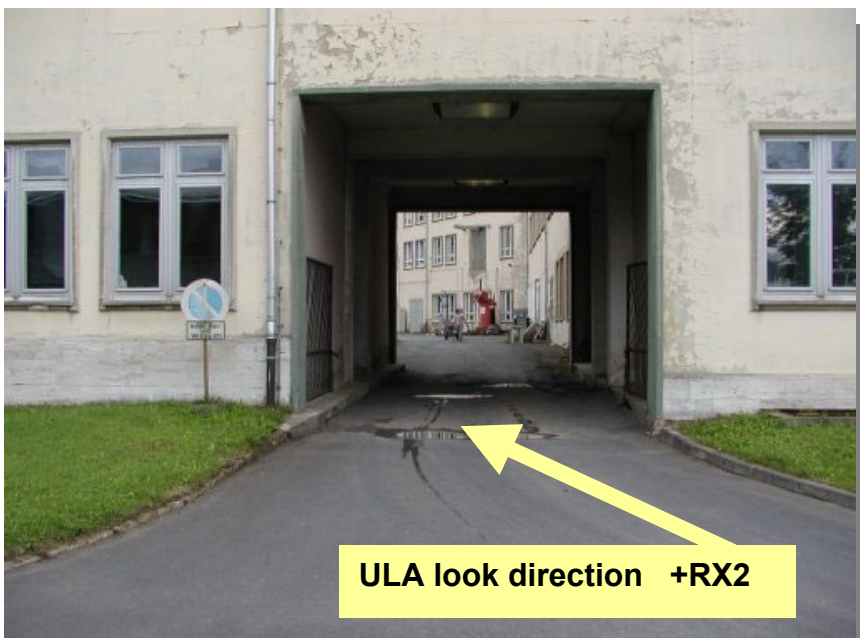
8 elements uniform linear patch array (ULA) with separate ports for horizontal and vertical polarization, only vertical polarization measured

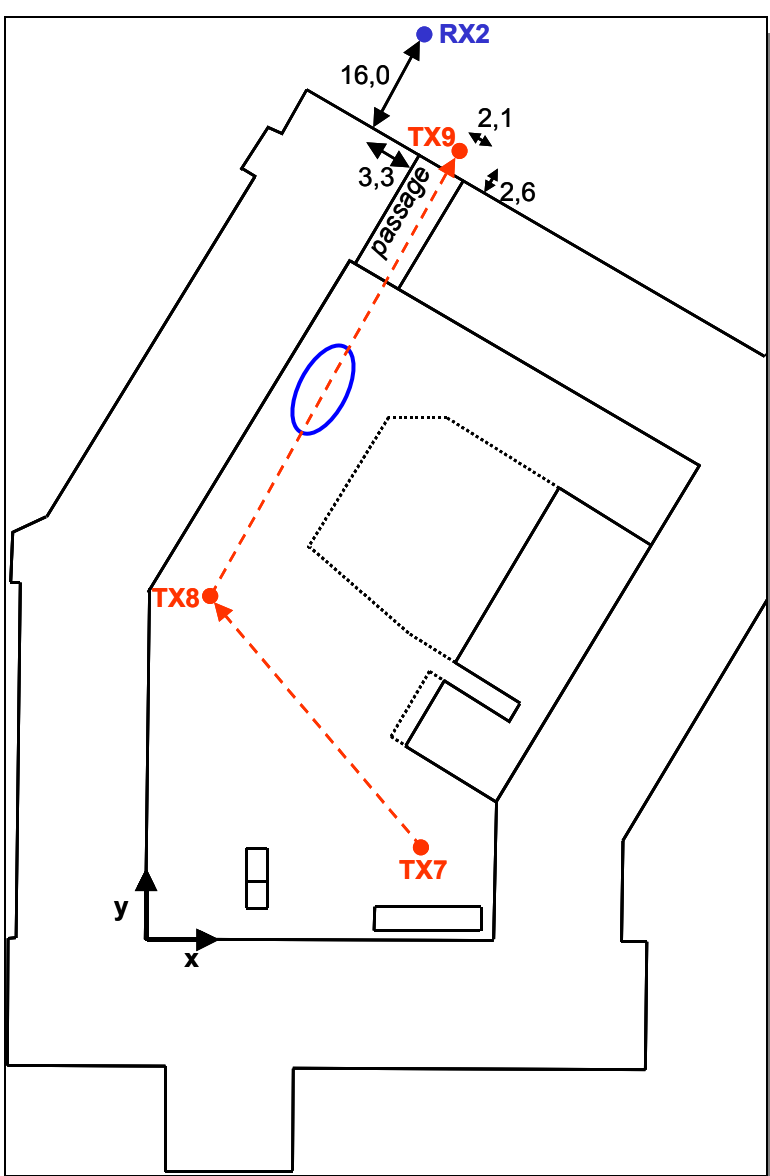
element separation:  $0.4943 \lambda$   
height above ground: ca. 1.2 m

## References:

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## Photograph and sketch of the measurement environment:





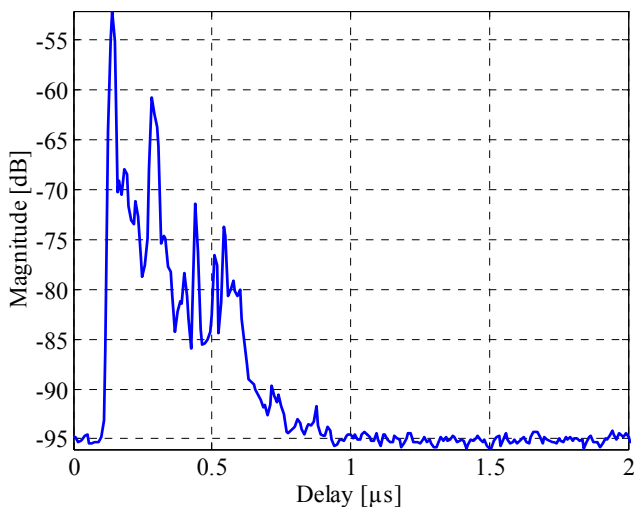
The receive array looks into a passage leading to large courtyard which is completely enclosed by a building of about 15 m.

The sample data cover a section of about 2 seconds or 2.7 meters while the transmit array moved from point TX8 to point TX9 (encircled in blue). This section corresponds to snapshots 70 to 169 in the time-variant graphs below. The snapshot spacing is about  $0.47 \lambda$ .

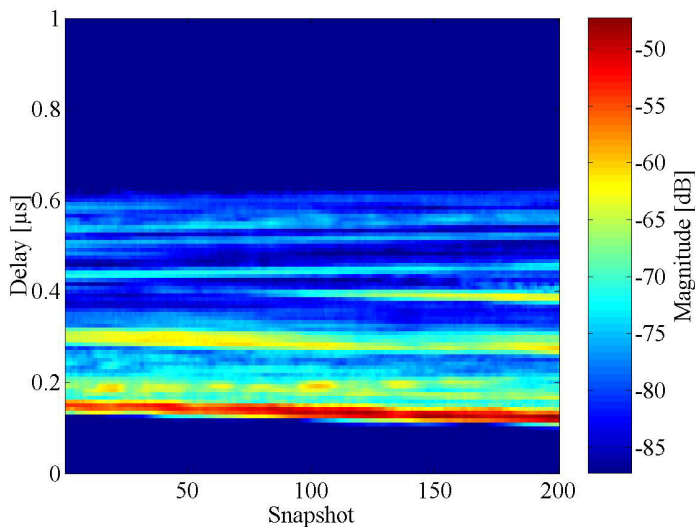


The Tx antenna's view towards the Rx which is placed outside of the courtyard.

## Selected data view:

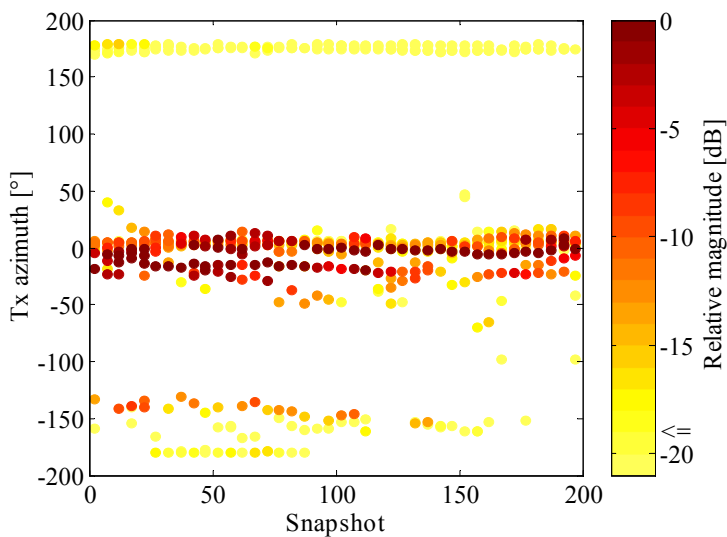


Delay spectrum: single snapshot averaged over all Tx and Rx antenna channels.



The time-variant delay spectrum averaged over all Tx and Rx antenna channels shows individually fading paths and an appearing path.

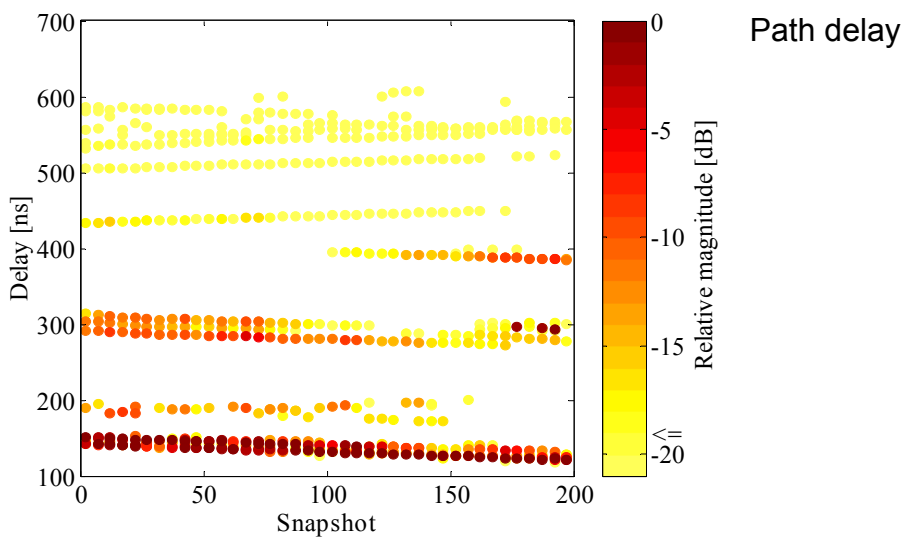
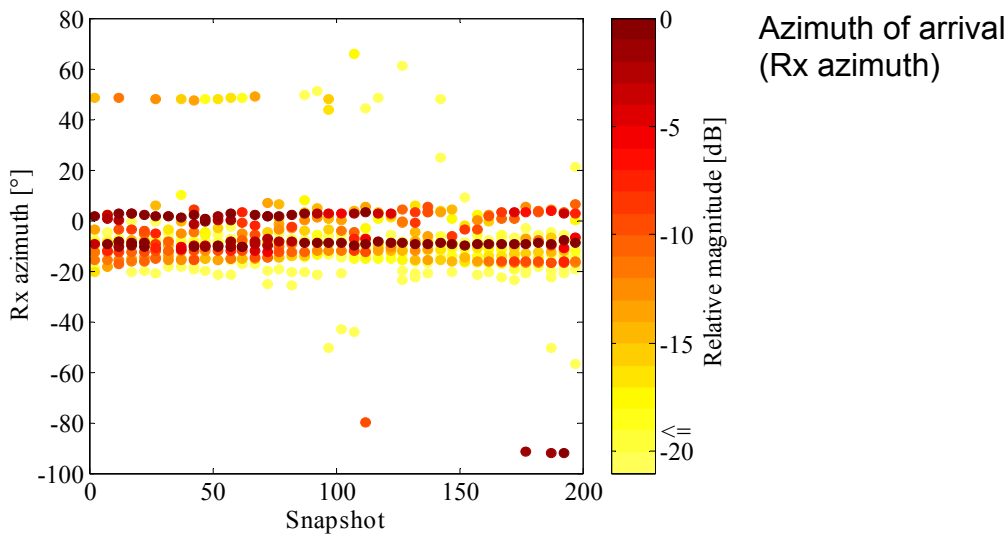
## Advanced parameter estimation results:



Joint 3dimensional superresolution parameter estimation by SAGE + gradient based Maximum-Likelihood (see COST 273 TD(02) 132)

Each estimated multipath component is represented by a dot in the dimensions

Azimuth of departure (Tx azimuth)



### Measurement file remarks:

- No array calibration
- No phase alignment to compensate the temporal offset between capturing the individual antenna channels (cf. [time diagram](#))
- Filename: <http://www.channelsounder.de/downloads/khoffmimo1.zip>