DEPLOYMENT CONSIDERATIONS FOR 3D-MIMO ARRAYS

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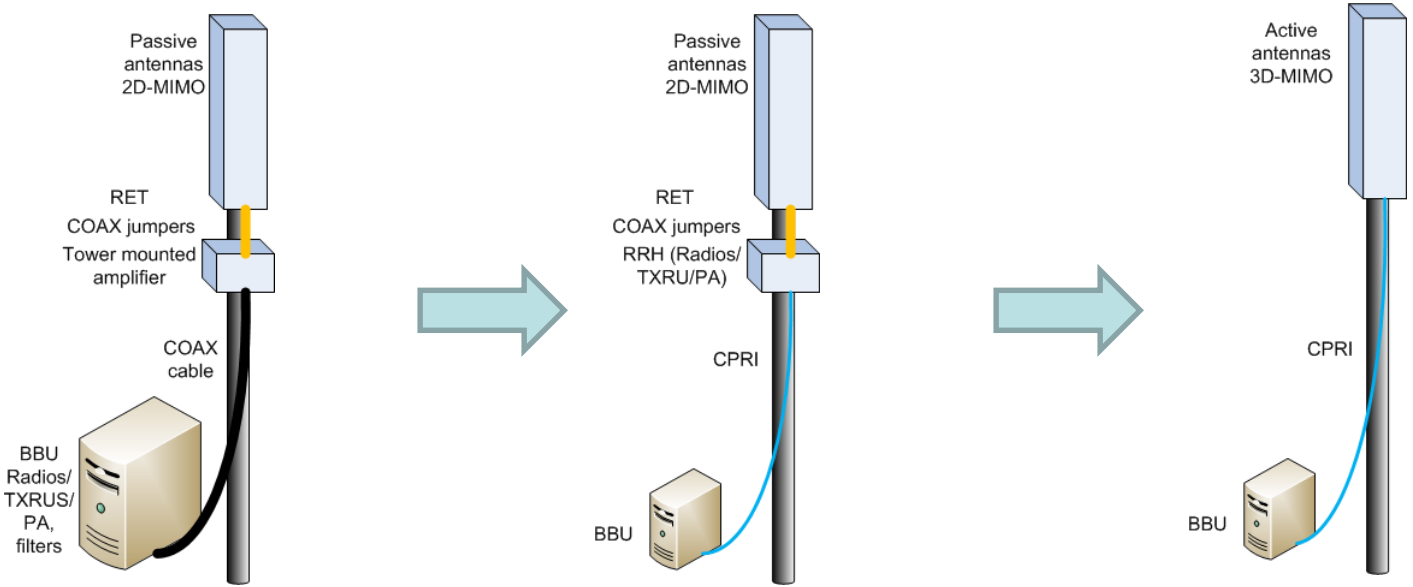
Evolution to AAS base-stations

- Conventional BS → remote radio head (RRH) → active antenna systems (AAS)



Reduced footprint and more efficient delivery of power

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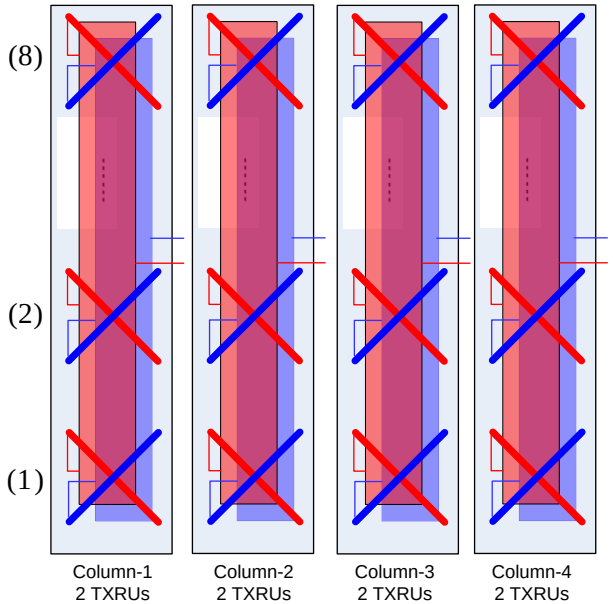
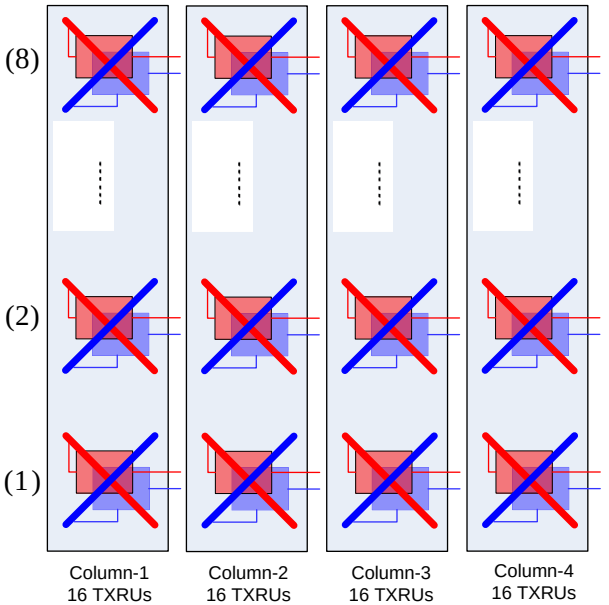
Active Antenna Systems

- Conventional passive antenna array:
- 64 physical antenna elements
- 4 columns, 8 transceiver units



- 2D antenna array:
- 64 physical antenna elements
- 4 columns, 64 transceiver units



Similar Footprint: 8 TXRUs → 64 TXRUs

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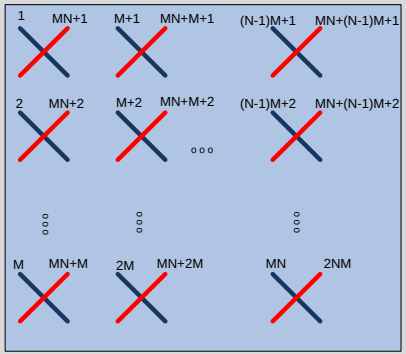
Transceiver Virtualization Options

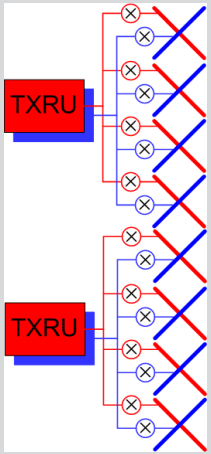
- Complexity versus performance tradeoff (next slide)
- RF weights are phase-only array-response vectors, wideband, static in simulations

Physical Antenna Array



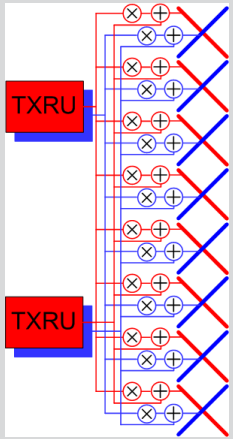
64 physical antennas
4 columns
8 rows
2 polarizations

Sub-Array Virtualization



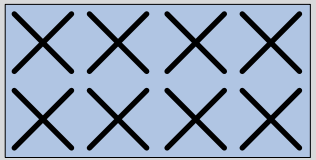
Four 4x1 virtualization weight vectors applied per column ➔ 4 TXRUs/Column

Full-Connection Virtualization



Four 4x1 virtualization weight vectors applied per column ➔ 4 TXRUs/Column

Logical Antenna Ports



➔ 8 rows of physical antennas
➔ 2 rows of logical antenna ports
➔ 4 transceivers per column
➔16 transceiver units
➔16 antenna ports

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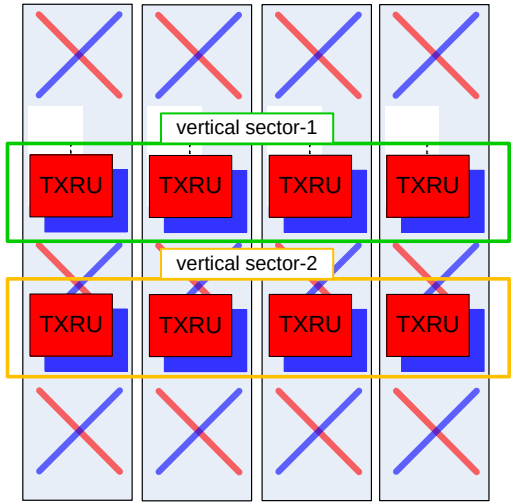
Vertical sectorization

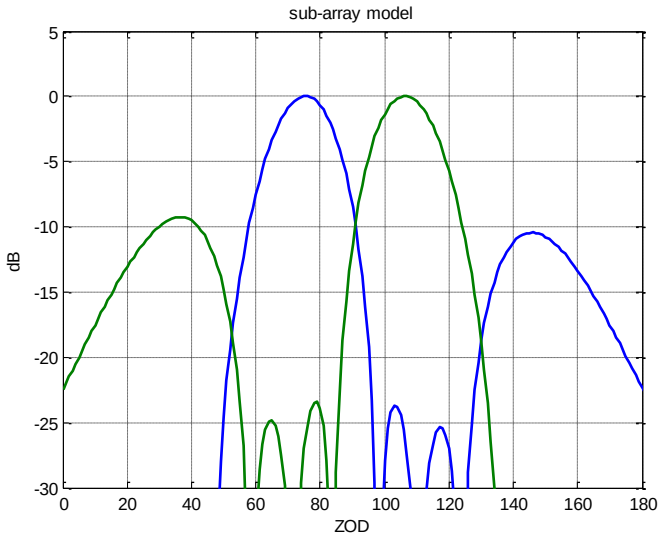
- single cell-id with LTE-R12 or separate cell-id with LTE-R8



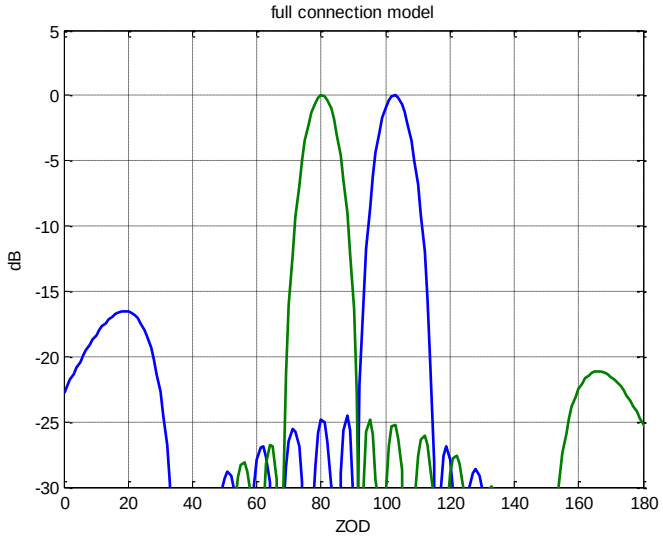
Specification transparent method supporting 16 TXRUs

RF Beam shapes for vertical sectorization

- Sub-array



- Full-connection



Reduced interference between vertical beams – complexity tradeoff

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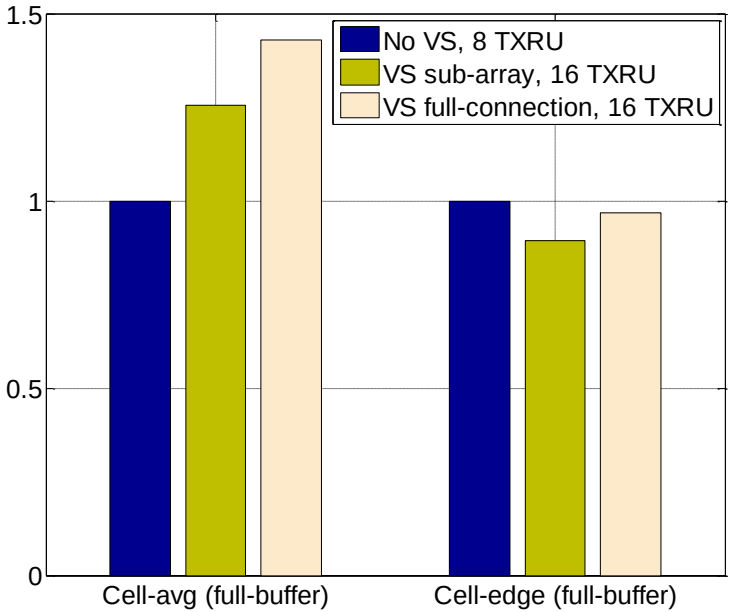
VS performance depends on RF beams

- Performance depends on the AAS architecture



Gain in system performance with full-connection model

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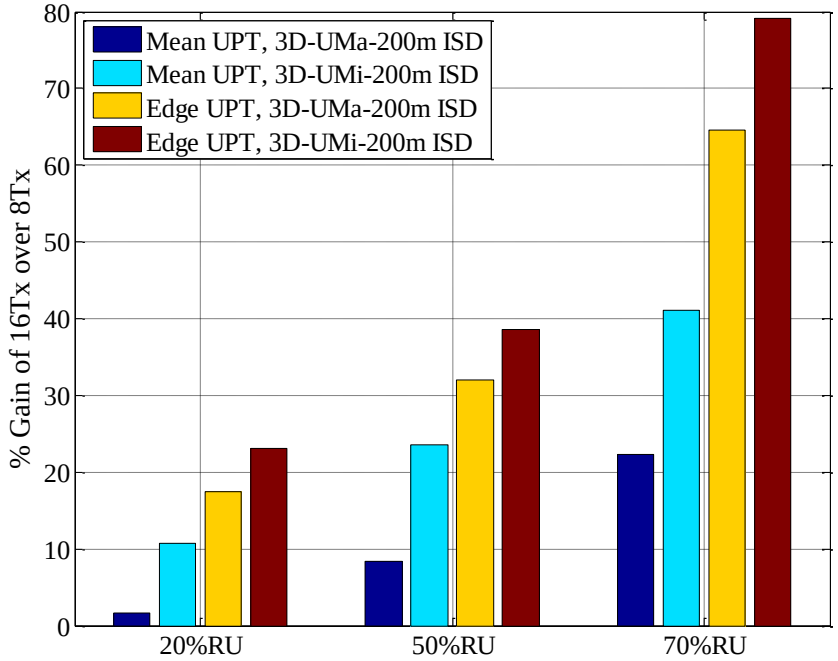
VS system performance in FTP traffic

- Gain depends on the deployment scenario and load



More gains in system performance in UMi compared to UMa

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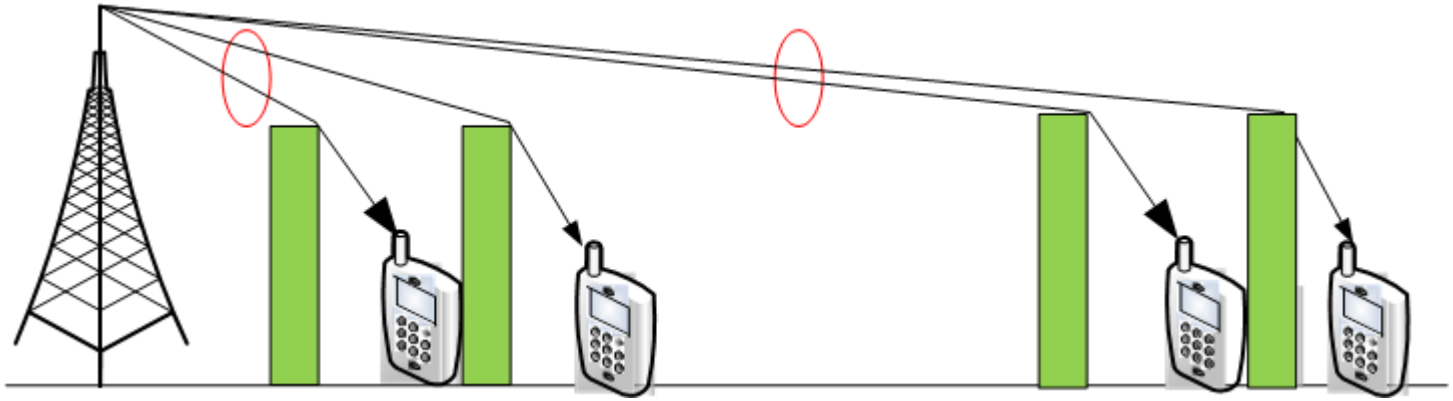
Geometrical considerations: 200m vs 500m

- UE density is uniform in the horizontal plane but non-uniform in the (elevation) angular domain
- UEs closer to the eNB provide better angular separation in the elevation dimension



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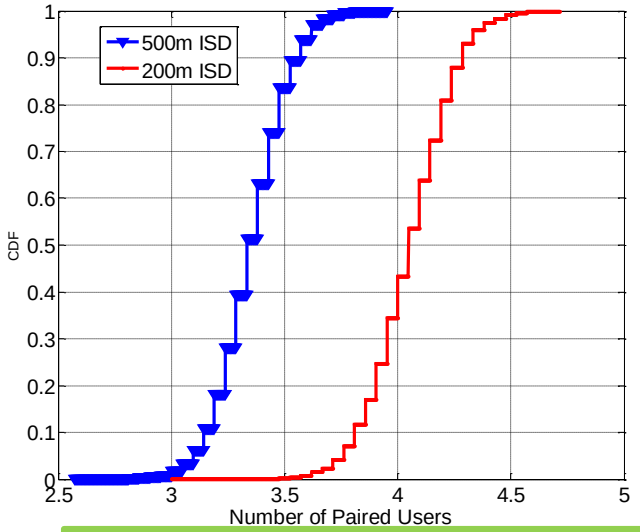
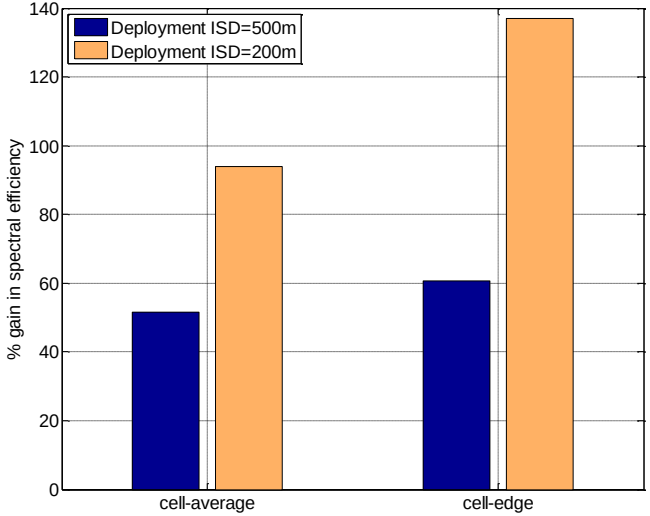
3D-MIMO performance depends on cell density

- MU-MIMO pairing



- System performance



- Denser macro networks with smaller ISD can provide higher downlink throughput gains with AAS deployments that leverage the elevation dimension. Note that AAS can also be utilized to improve uplink coverage. The scheduler is able to provide certain tradeoffs between coverage and capacity
- Comparison of 2TXRU vs 16TXRU, full-buffer, ideal feedback

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Thank you!

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