

3GPP TSG-RAN WG1#80bis

R1-153161



ERICSSON

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SOURCE: ERICSSON

TITLE: MULTIUSER SUPERPOSITION
PERFORMANCE UPPER BOUND

AGENDA ITEM: 6.2.7.3

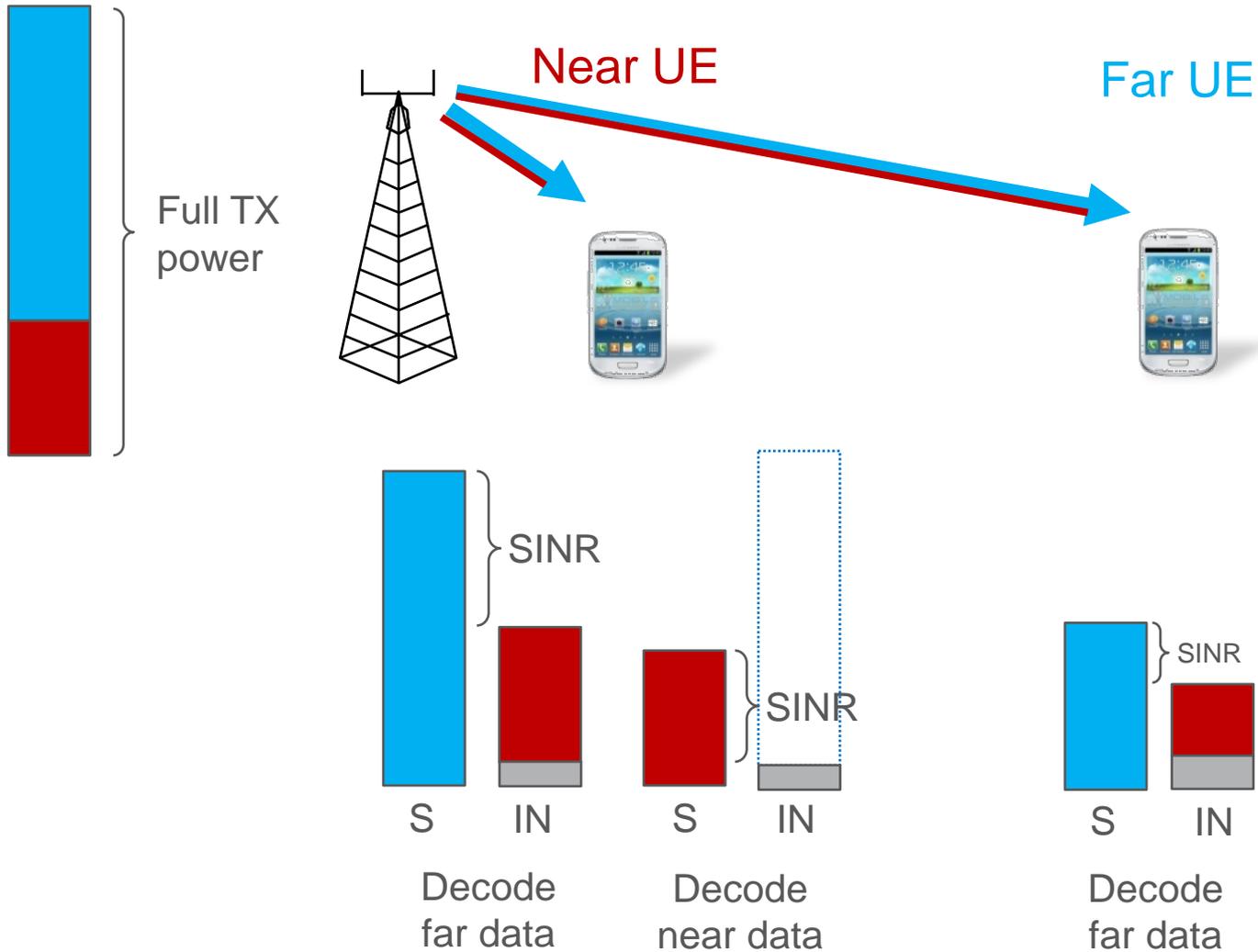
DOCUMENT FOR: DISCUSSION

NOMA CONCEPT



- › NOMA in simplest form (see e.g. [\[1\]](#))
 - Two-user MIMO; one near user and one far user
 - Share exactly the same channel, same beam, same precoder
 - › Same pilots shared
 - Hard CWIC
 - › The near users decodes and cancels the far used data stream first, then decodes own
 - › The far user decodes its own data stream
- › Base station scheduling decision
 - Which two users to combine
 - What power share to each data stream

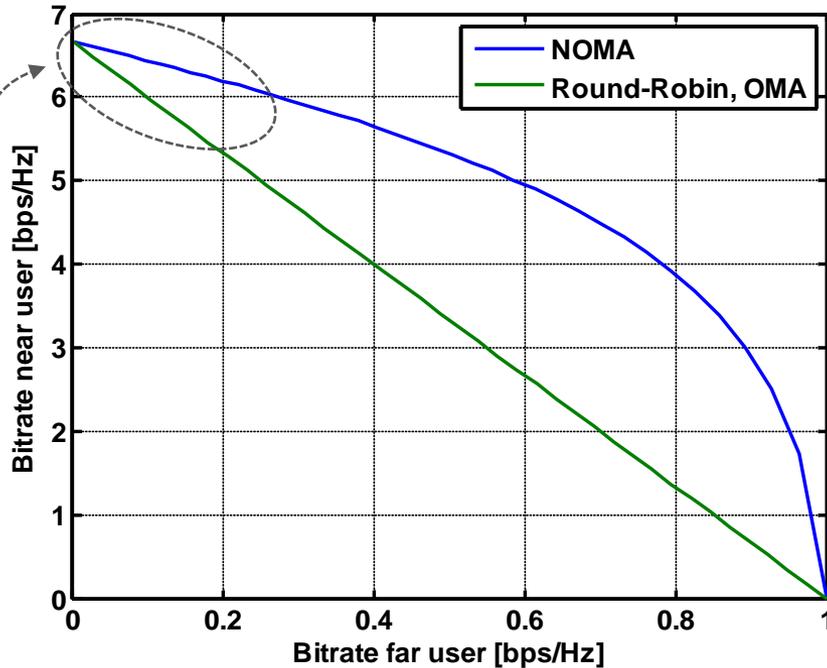
NOMA CONCEPT POWER SPLIT



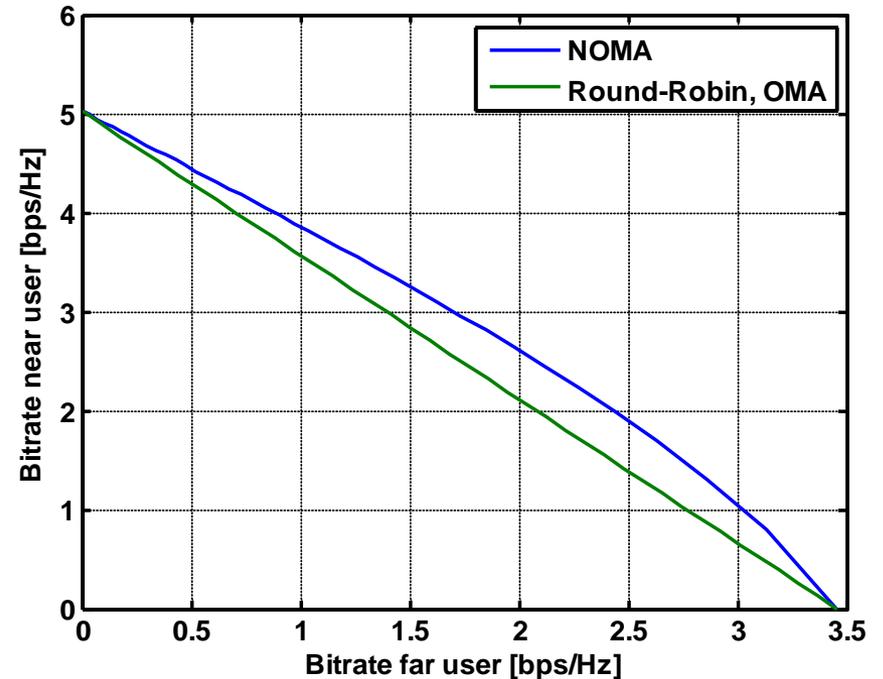
LINK LEVEL NOMA



Link-level NOMA, near SNR 20 dB, far SNR 0 dB



Link-level NOMA, near SNR 15 dB, far SNR 10 dB



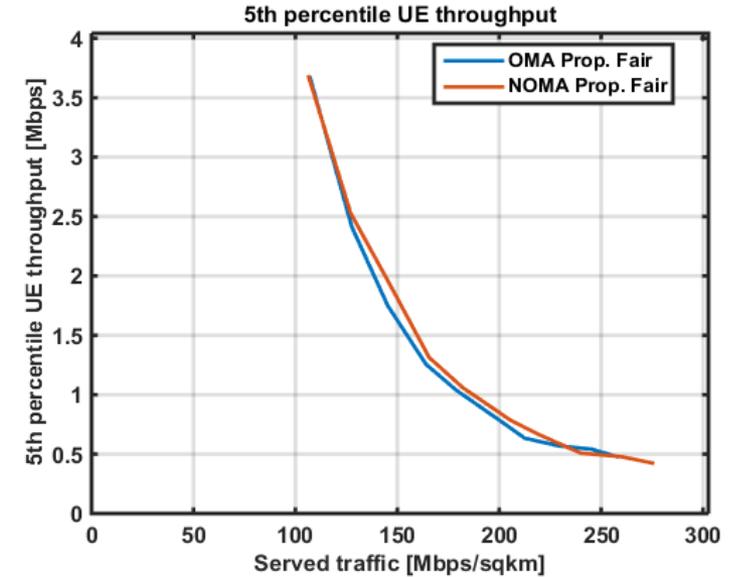
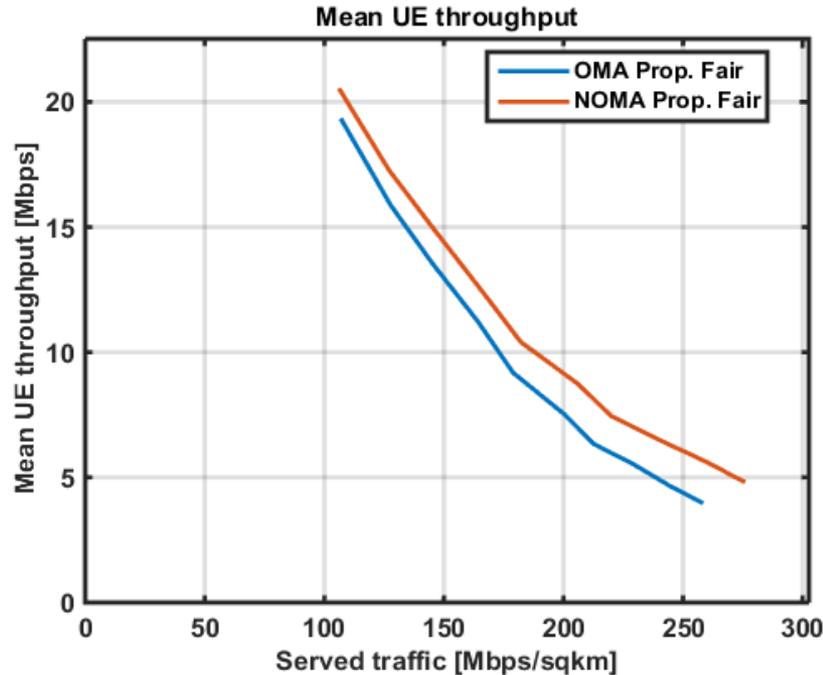
- › Large power imbalance between co-scheduled users required for gains
- › Proportional-fair scheduling will optimize mostly for strongest user – NOMA – OMA gap is small

SYSTEM EVALUATION

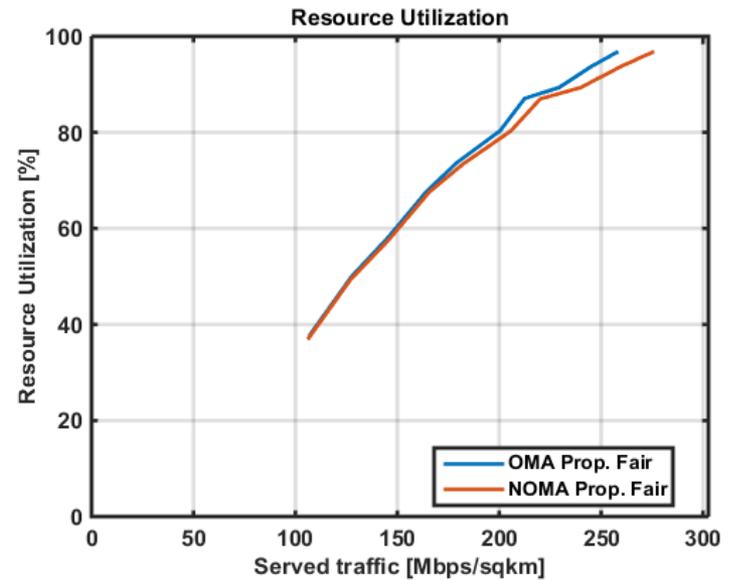


- › System simulation parameters
 - 7 3-sector macro sites in hexagonal deployment
 - › 1 eNB antenna, 1 UE antenna
 - Indoor and outdoor users, instantaneous fast fading
 - No MCS or alphabet limitations
 - 6% TX EVM
 - **Non-full buffer traffic**, fixed packet size and Poisson arrival
- › NOMA = Proportional-fair scheduler with exhaustive search of all UE pairs for maximum prop-fair metric
- › OMA = Traditional single-user-per-cell scheduling

MACRO PROPORTIONAL-FAIR



- › 15-20% NOMA mean rate gain at high load
- › Less than 10% gain at cell edge



SYSTEM OBSERVATIONS



- › NOMA gains observed up to 20% in mean and 10% in cell edge
 - This is under highly ideal conditions, genie-aided CQI, and perfect channel estimation
 - Gains will be lower with real CQI and UE impairments
- › Essential to evaluate NOMA with non-full buffer traffic model
 - NOMA relies on finding good near-far pairs in same cell with same (or non separating) precoding
 - The non-full buffer traffic model implies near users are active shorter times than the far users – this is a good reflection of reality – and makes NOMA pairing less effective

CONCLUSIONS

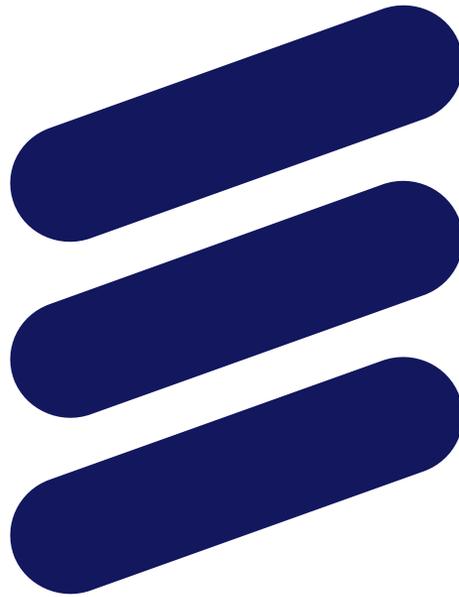


- › Upper bounds on NOMA gains are on order of 15-20% in mean and up to 10% at cell edge with non-full-buffer traffic at high load
 - These upper bound evaluations use perfect channel estimation, genie-aided CSI reporting and no UE impairments
 - Performance will be degraded by imperfect CQI

REFERENCES



- › [1] [Non-Orthogonal Multiple Access \(NOMA\) for Future Radio Access](#), Saito et. al.



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