

3GPP TSG RAN WG1 Meeting #55bis
Ljubljana, Slovenia
12 – 16 January, 2009

R1-090241

Impact of Planning on eNB – Relay Link Model

Agenda Item: 12.6 Study Item on LTE-Advanced, Relaying

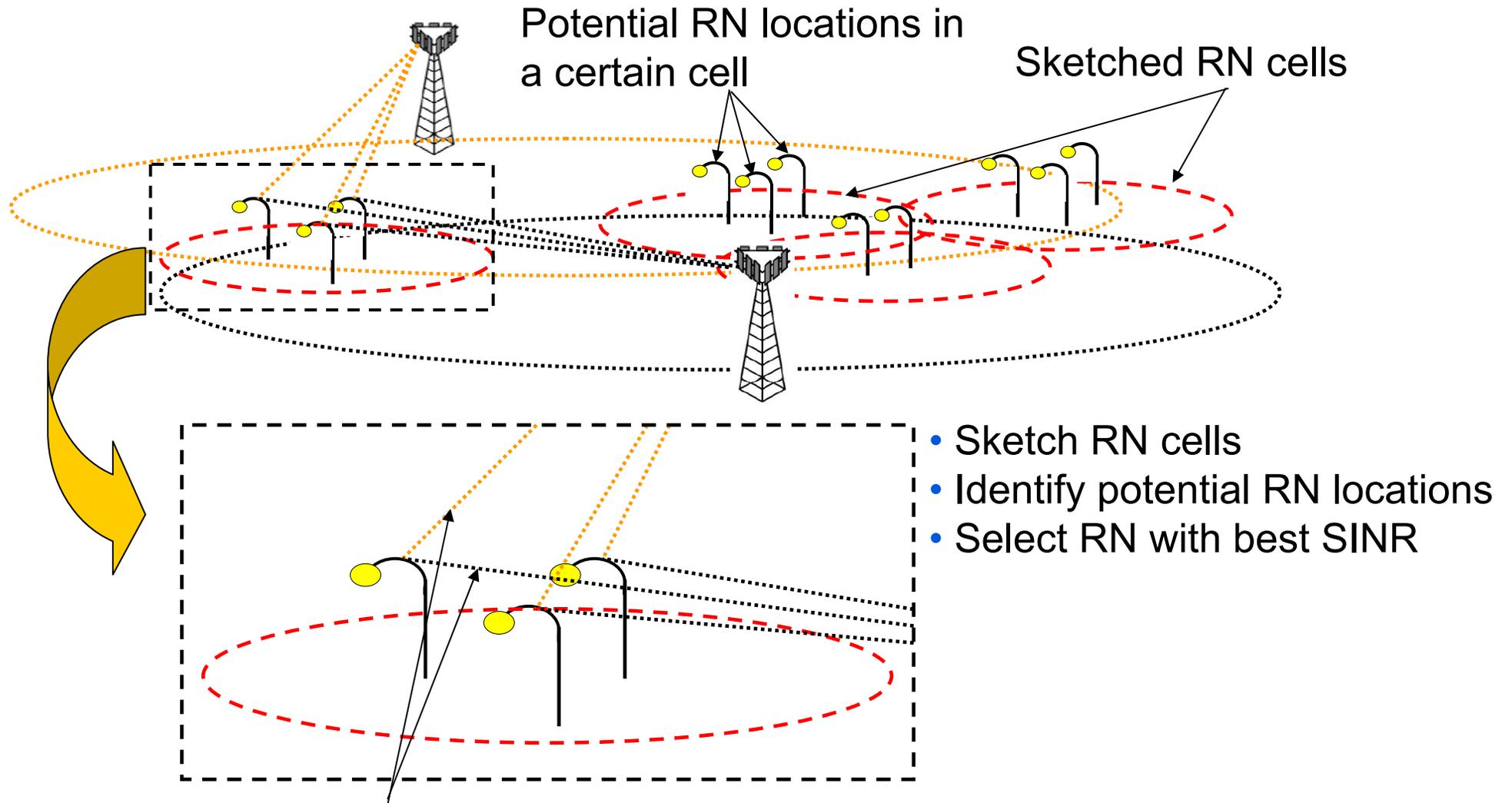
Source: Nokia Siemens Networks & Nokia

Document for: Discussion & Decision

Introduction

- Cell planning and site selection tools are used routinely by operators to improve system performance. That's not modelled explicitly in simulations but included in propagation formulas.
- Similarly RNs can be expected to be deployed suitably, in contrast to users that don't behave channel aware and therefore suffer from band shadowing occasionally.
- We investigated the impact of relay deployment on the eNB-RN link, assuming there are 4 candidate deployments in the vicinity.

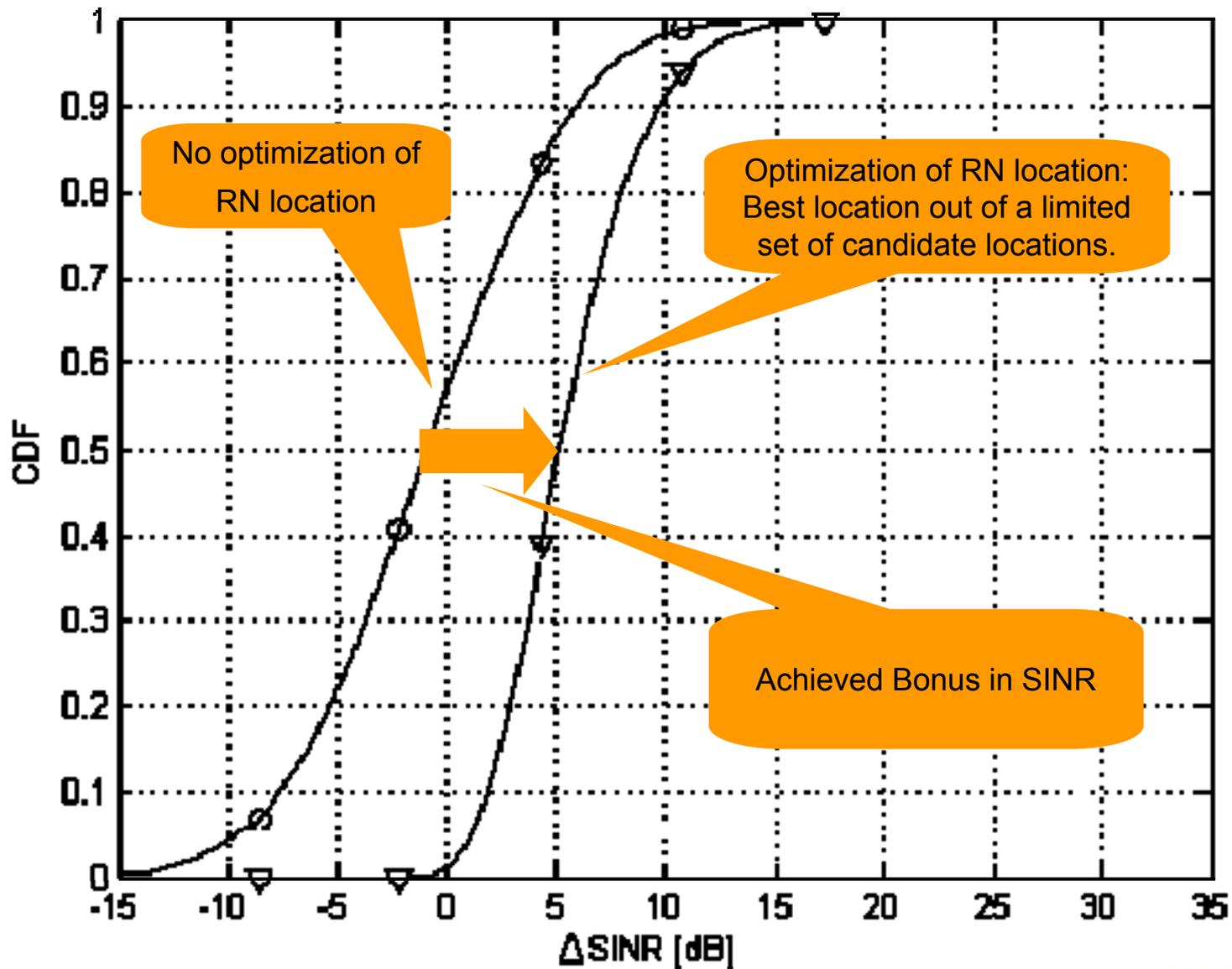
Illustration



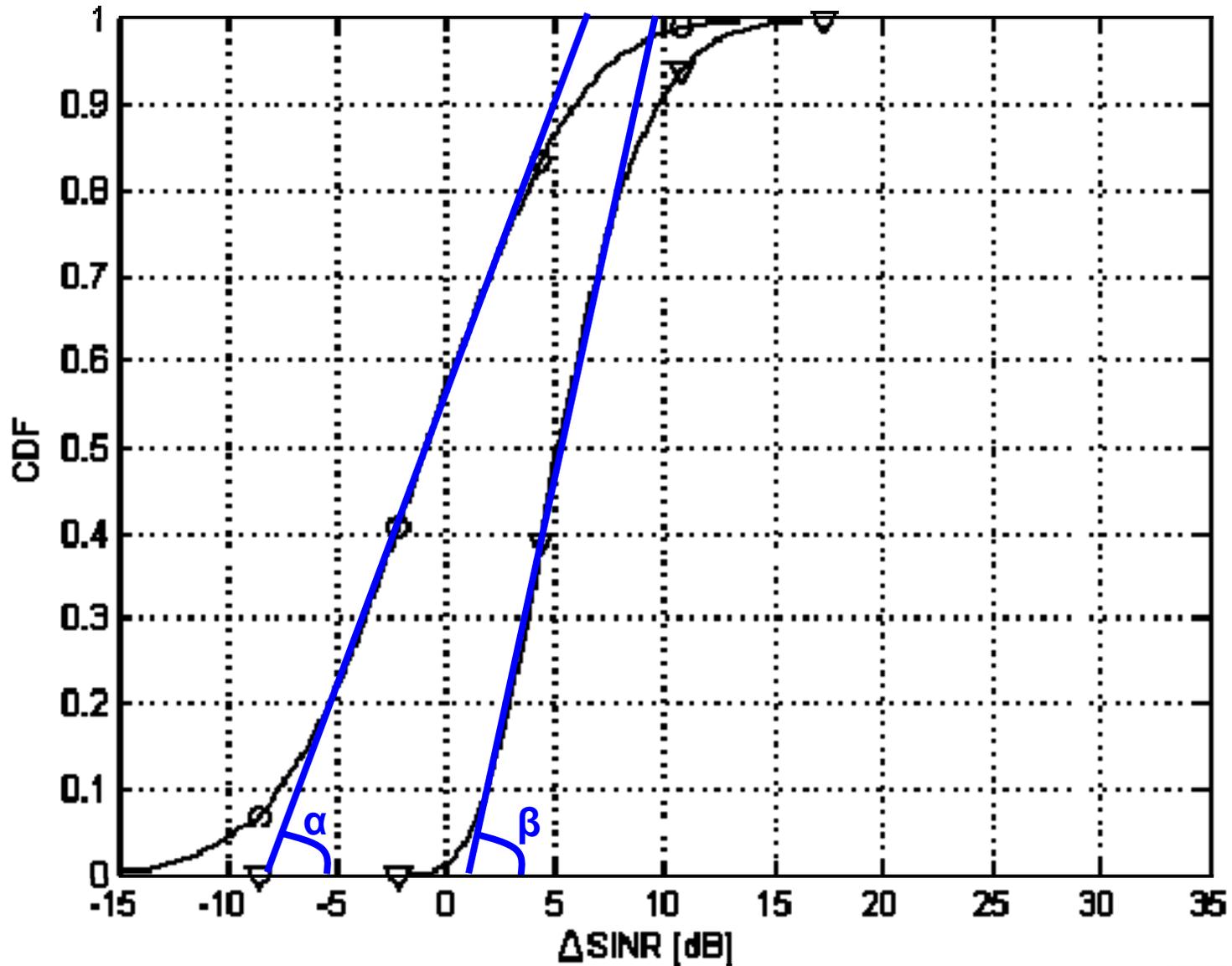
Channel models under discussion for eNB-RN link

- eNB-RN link
 - $124.5 + 37.6\log_{10}(R)$ with R in Km
 - shadow standard deviation 6 dB
 - Similar formula as already used in 3GPP plus 3.6dB bonus due to higher RN height compared to UE, as suggested by propagation formulas that model UE height.
 - Proposed in [1]
 - Coordinated or uncoordinated deployment possible

Effect of shadow distribution on SINR eNB – RN link (1)



Effect of shadow distribution on SINR eNB – RN link (3)



β/α is the ratio by which the shadow standard deviation is reduced due to the selection process

Conclusions

- Relay nodes will not be deployed at random (like users) but will be deployed reasonably by operators.
- This allows to select favorable RN placements by selection from a set of close by potential RN deployments
- With the currently discussed evaluation parameters we observe a gain of some 6 dB in SINR of the link to the serving eNB. Further more the effective variations of the shadowing after site selection will be reduced to some 2.6 dB.
- This effect can be taken into account explicitly by taking the deployment into account in simulations, or implicitly by taking the gain and the lower standard deviation into account. We propose to capture this in TR36.814
- This effect will not apply for purely random RN deployments, which are not considered to be done by operators anyhow.

Text proposal for TR 36.814

Annex A: Simulation model

Table A.2.1.1.2-3. Placing of new nodes and UEs

Configuration	UE density across macro cells*	UE distribution within a macro cell	New node distribution within a macro cell	Comments
1	Uniform 25/macro cell	Uniform	Uncorrelated	Capacity enhancement
2	Non-uniform [10 – 100]/macro cell	Uniform	Uncorrelated	Sensitivity to non-uniform UE density across macro cells
3	Non-uniform [10 – 100]/macro cell	Uniform	Correlated**	Cell edge enhancement
4	Non-uniform [10 – 100]/macro cell	Clusters	Correlated**	Hotspot capacity enhancement

* New node density is proportional to the UE density in each macro cell. UE density is defined as the number of UEs in the geographic area of a macro cell.

**Relay and hotzone nodes, often deployed by planning, may be placed by [TBD] method.

Relay site planning can optimize eNB RN link, this can be modelled by reducing the shadowing standard deviation from 6dB to [2.6dB] and increasing the SINR by [6dB] on this link.

References

- [1] 3GPP TR 36.814 V0.2.2, Further Advancements for E-UTRAN Physical Layer Aspects.