3GPP TSG-GERAN SAIC Ad-hoc **Tdoc GAHS-030040**
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SAIC network capacity with different antenna patterns and performance criteria

1. Introduction

This document presents network level simulation results for SAIC when using both 90 and 65 degree directional antennas. Since there has been a lot of discussion about the difference performance metrics, the results are presented with two different FER averaging periods and using two different levels of satisfied user ratios (network QoS).

2. Simulation setup

Simulations were run using Configuration 3, i.e. assuming 2.4 MHz bandwidth with 12 hopping frequencies (only the hopping layer was simulated). An RxQual/RxLev –based downlink power control algorithm was used [1].

AMR 7.4 codec was used in this study[*]. All MSs use DTX. Call dropping was not taken into account, since it was not relevant in this study.

In link level simulations that provide the mapping tables to system level, the agreed GERAN link level interference model was used (according to Configuration 3). Synchronized network was assumed.

Two different FER statistics sample intervals were used:

A) Whole call

B) 4 SACCH periods (1.92 seconds)

For both options, the sample was considered to be of good quality if its average FER was 2%[†] or less.

The results are reported for points where 95% and 98% of the samples were of good quality.

3. Results

Figure 1 and Figure 2 show the call quality versus frequency load for both SAIC and non-SAIC cases when using 65 and 90 degree antennas, respectively. The solid line shows the results for case A (call level averaging) and the dotted line for case B (1.92s averaging).

The results with the wider antenna beamwidth are clearly worse, as expected. The difference between the two quality metrics is surprisingly small, although the shorter averaging seems to always provide better results.

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[*] Default codec in Configuration 4 was AMR5.9. However, we think the 7.4 codec is a better comprimise between capacity and quality. AMR 5.9 is not considered as toll-quality codec and in reality AMR LA would be used and 7.4 codec is a good average of the available codec modes.

[†] Note: There are 96 speech blocks in case B). Thus, only one erroneous frame is accepted in a sample.

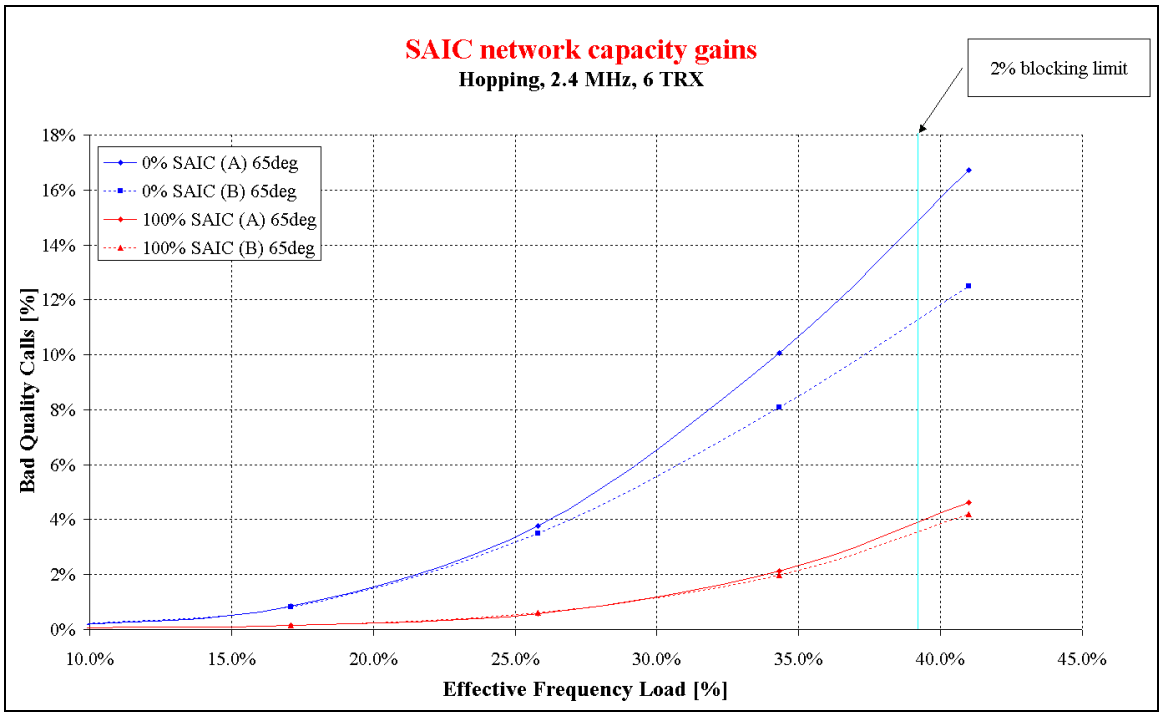

Figure 1. SAIC gains with 65 degree antenna. (A) = call level averaging, (B) = 1.92s averaging.

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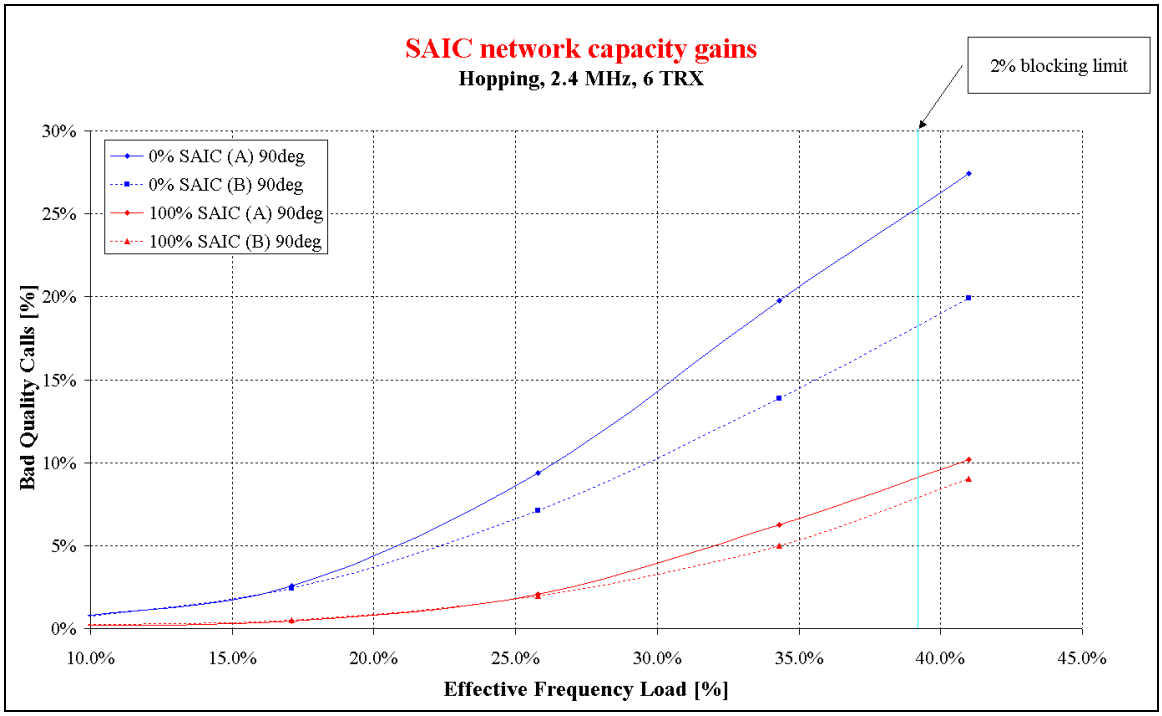

Figure 2. SAIC gains with 90 degree antenna. (A) = call level averaging, (B) = 1.92s averaging.

4. Summary and conclusions

Figure 3 summarizes the results presented above. SAIC gains are biggest with

- Tighter network QoS criteria (98% limit)
- Larger antenna beamwidth (90 degree)

The selected FER averaging period seems not to have big effect in the capacity gains.

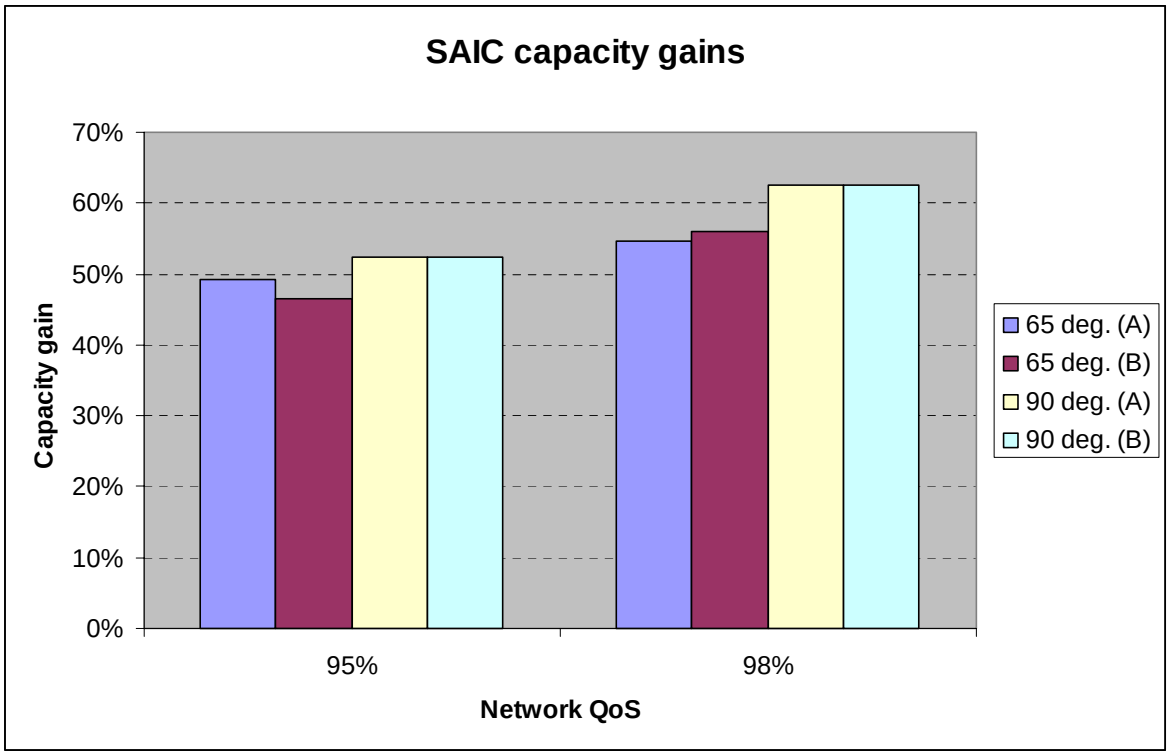

Figure 3. SAIC capacity gains with the different setups.

Overall, the SAIC gains are within the range of 50-60% when assuming full SAIC penetration. This is very well in accordance with the results reported previously.

5. References

1. "A proposal for common power control algorithm to be used in SAIC network simulations", source Nokia, sent to 3GPP_TSG_GERAN_WG1 list on 29th April, 2003.