

**Agenda item:**

**Source:** Texas Instruments

**Title:** Response to Cell Parameter Cycling Concerns raised in WG1#8

**Document for:** Discussion

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In WG1 #8, a few issues were raised regarding the cycling of cell parameters [1]. We answer these concerns in this report.

## 1. Effect of cell parameter cycling on acquisition

There is no degradation in acquisition performance as is explained below.

Cycling over 4 frames, the cell parameters can be:

1 2 3 4	instead of	1 1 1 1
2 3 4 1		2 2 2 2
3 4 1 2		3 3 3 3
4 1 2 3		4 4 4 4

Normally we have to look for all 4 midambles (we can combine them over different frames) which is the case even if cell parameters are cycled. Thus, there is no degradation in acquisition performance.

## 2. TDD to TDD handover

In this case, we only need to acquire to the target (Stages 1, 2, and 3). If the SFN's are synchronized between basestations, then no further processing is required and the UE knows which midamble to monitor. We require the SFN's to be synchronized, at least for the two LSB's, and this requirement is stated in the Liaison Statement R1-99j10.

## 3. GSM to TDD handover

For this case, the SCH will indicate whether the frame is odd or even. Thus, the uncertainty in the cell parameter cycling is two instead of four. By modulating the PSCH with respect to the midamble, this ambiguity can be resolved. If the initial cell parameter assignment is one of the first two in a group, then the PSCH is modulated with a +1. If the initial cell parameter assignment is one of the last two in a group, then the PSCH is modulated with a -1. The simulation results in Figures 1-4 show that it is possible to use the midamble phase as a channel estimate to discern this modulation.

In the simulations for Figures 1-4, the non-coherent no-cycling curve is obtained when there is no cell cycling and the beacon is in a different time slot from the PSCH time slot. In such a case, for the detection of stage 3 the midamble correlations cannot be averaged coherently over the observation window. The coherent no-cycling case is when there is no cell cycling but the beacon is in the same time slot as the PSCH. In such a case, the midamble correlations can be averaged coherently using the phase reference from the PSCH and the maximum of this correlation gives the cell parameter of the BS. Figures 1-4 show that by placing the beacon in the same channel as the PSCH gives a significant improvement (>1dB) in the

Stage 3 performance of acquisition. The third curve in the figures corresponds to the case where cell cycling is used and the cycling is indicated by modulating the PSCH by + or -1 w.r.t the midamble phase. Note that this does not affect the Stage 2 of acquisition as both  $c_p$  and the  $c_s$  are flipped in sign. In stage 3 of acquisition, we can still coherently average the midamble correlation over a number of slots but we pick the maximum of the absolute value of the results in order to determine the cell parameter cycling which gives rise to a small degradation in the performance. This maximum together with its sign determines the actual cell parameter cycling. We can see that the degradation in performance is  $\sim 0.5\text{dB}$ . Some other parameters assumed in the simulations are:

- a) PSCH and the midamble (beacon) despread SNR are assumed to be same.
- b) The cross correlations between the different midambles as also those between the PSCH and the midambles are assumed to be quite small and hence they are neglected.
- c) For the coherent accumulation simulations, the gaps between the midamble (beacon) and the PSCH is chosen to be the minimum difference (0) for Figure 1 and the maximum difference ( $312.5\mu\text{s}$ ) for Figures 2-4.
- d) For GSM to TDD handover, the 5ms observation window occurs every 120ms. Since the correlation between the fades over this interval is very small, it is neglected in the simulation.

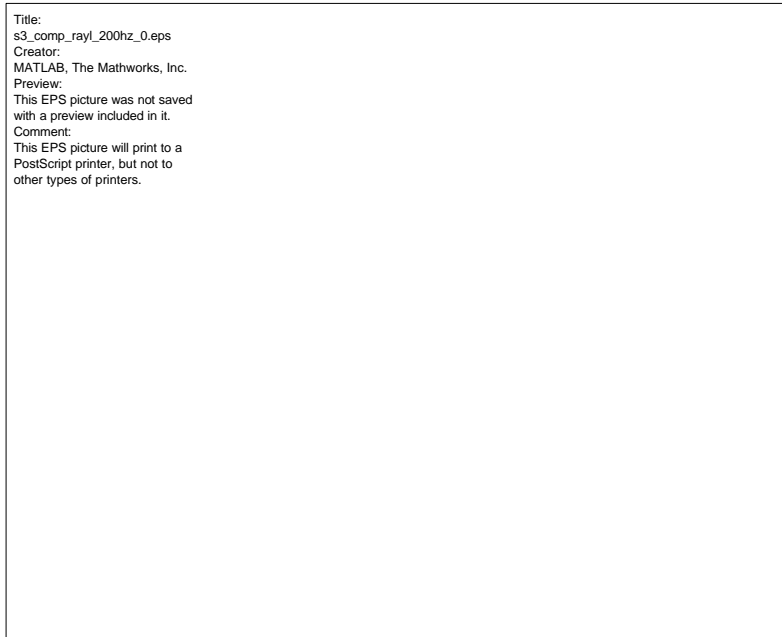


Figure 1.



Figure 2.



Figure 3.



Figure 4.

## Reference:

- [1] Report from AdHoc #1, TSGR1#8(99)G81.
- [2] Text proposal for cycling of cell parameters for TDD, Texas Instruments, TSGR1#8(99)G16.