TSGR1#19-01-0245

Source: LG Electronics and SK Telecom

Title: Considerations on Timing Alignment Bits for USTS

Document for: Information & Discussion

_____

1. Introduction

Timing Alignment Bit (TAB) field improvements for USTS in soft handover were presented at WG1 #18 in Boston [1]. Two methods for improving the reliability of TAB for USTS in [1] were proposed on the basis of the previous TAB and timing control in [2]. SK telecom and Nokia indicated that the interval for timing updates for USTS in UE was changed from 20ms to 200ms in the latest USTS TR [3]. However, the TAB in Node B is still to be sent every 20ms that means UE can have 10 TABs in between making timing updates. Thus, it is needed to consider TAB according to [3]. In this contribution, several aspects of TAB are investigated and compared with each other.

2. Considerations on TAB for USTS

Two aspects on TAB can be considered as

?? TAB bit pattern

?? Independent / Dependent

?? TAB transmission in Node B

?? Interval (20ms / 40ms / 50ms / 100ms)

?? Flexibility (fixed / variable)

2.1 TAB bit pattern

According to the latest TR [3], we can consider TAB bit pattern is independent or dependent. Independent TAB bit pattern means that every TAB bit is determined independently in Node B, and dependent TAB bit pattern expresses that 10 TABs are encoded by certain coding scheme such as bi-orthogonal coding. Intuitively, independent TAB bit pattern is proper to fast channel variations during the timing update interval such as 200ms. Meanwhile, dependent TAB bit pattern seems to be fit for the situation in which there is no variation and thus only one TAB symbol is enough to send in Node B during the timing update interval. In TAB bit pattern, the repeated TABs improve the reliability and correspond to the second method proposed in [1]. Figure 2.1 shows one example of dependent TAB bit pattern which employs bi-orthogonal coding.
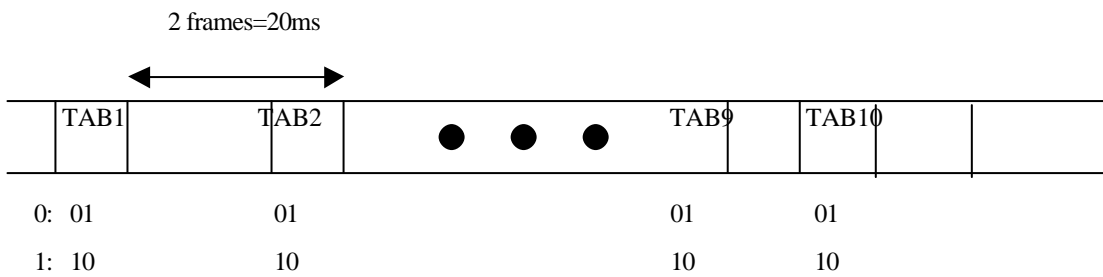
2 frames=20ms

| TAB1 | TAB2 | ● ● ● | TAB9 | TAB10 | |

0: 01   01   01   01

1: 10   10   10   10

Figure 2.1 one example of dependent TAB bit pattern using bi-orthogonal coding.

2.2 TAB transmission in Node B

By combining of 10 TABs somehow it is possible to make more reliable decision of timing updates in UE. However, it is needed to check the intervals of TAB transmission on Node B because TABs are punctured into TPC fields in DPCCH. We have proposed several intervals such as 40ms / 50ms / 100ms, including 20ms described in [3]. According to each interval, 5 / 4 / 2 TABs are transmitted respectively. To determine the appropriate interval, simulation results are required in the standardization phase. As well, we can consider the flexibility of TAB as fixed or variable transmission interval. In the variable case, the intervals can be adaptively determined according to channel environments and the required reliability. The impacts on WG2 / 3 should also be considered to clarify the operation of this scheme.

3. Conclusions

We have considered and discussed several aspects of TABs for USTS, in which TAB bit pattern and TAB transmission in Node B for USTS. The TAB bit pattern is introduced as independent or dependent. As well, several intervals are proposed for TAB transmission in Node B. By using the proposed TABs, USTS can be operated more reliably and adaptively. However, the impacts on the performance should be considered to clarify the selection among the proposed TAB aspects for USTS at standardization phase. We propose that the texts in this contribution will be included in the study report for USTS.

4. References

[1] R1-00-0061, TAB field improvements for USTS in soft handover, LG Electronics.

[2] R1-01-0054, Study report for USTS, v0.0.1, SK Telecom.

[3] R1-01-0163, Study report for USTS, v0.1.0, SK Telecom.