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Title: A Soft handover scheme for USTS

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1. Introduction

Soft handover in low mobility environments is required so that the handover for USTS was issued at WG1 #14 in Oulu. Three candidates of soft handover schemes for USTS were mentioned in [1] and have been proposed in [2]. One is USTS to non-USTS handover, and the others are USTS to USTS. In this contribution, one of USTS to USTS handover schemes is investigated and compared with the other method.

2. Proposed Soft Handover

Three candidates of soft handover have been proposed for USTS [2]. They are categorized by

Origin	Soft handover region	Target
a) USTS	Non-USTS(origin, target)	Non-USTS
b) USTS	USTS (origin) + async-USTS (target)	USTS
c) USTS	USTS (origin)+async-USTS (target) ? async-USTS (origin)+USTS (target)	USTS

Non-USTS means that Node B does not support USTS (R3 or R4). USTS means that Node B supports USTS (R5). In async-USTS, Node B supports USTS but timing synchronization is not kept any longer. If the target cell supports USTS, soft handover b) or c) can be operated in R5-Node Bs. In this contribution, the procedures and the considerations of soft handover c) are proposed and described.

2.1 Procedures

Figure 2.1 shows the handover procedure c) in two-cell layout. Both Node Bs are operated in USTS. UE1 and UE2 are operated in USTS with Node B #1 and Node B #2, respectively. When UE0 is operated in USTS, UE0 gets scrambling code (Scr11) and channelisation code (Ch3) from Node B #1. When UE0 enters the handover process, the radio link in async-USTS mode with Node B #2 is set up. However, only Node B #1 controls the transmit timing of UE0, which uses the same codes and is operated in USTS with Node B #1. While UE0 exists in the soft handover region, the reconfiguration process is required to assign new scrambling code (Scr21), channelisation code (Ch11) and timing adjustment for async-USTS to USTS transition in Node B #2. Also USTS to async-USTS transition in Node B #1 is required. The required timing adjustment for new USTS link is obtained by RTPD and Tref. Timing of async USTS link in Node B #1 is acquired by the new USTS time adjustment and the time difference between Node B #1 and Node B #2. UE0 releases the radio link with Node B #1 when the UE0 does not

need soft handover and soft handover process is completed. Figure 2.2 shows the flow chart of soft handover c).

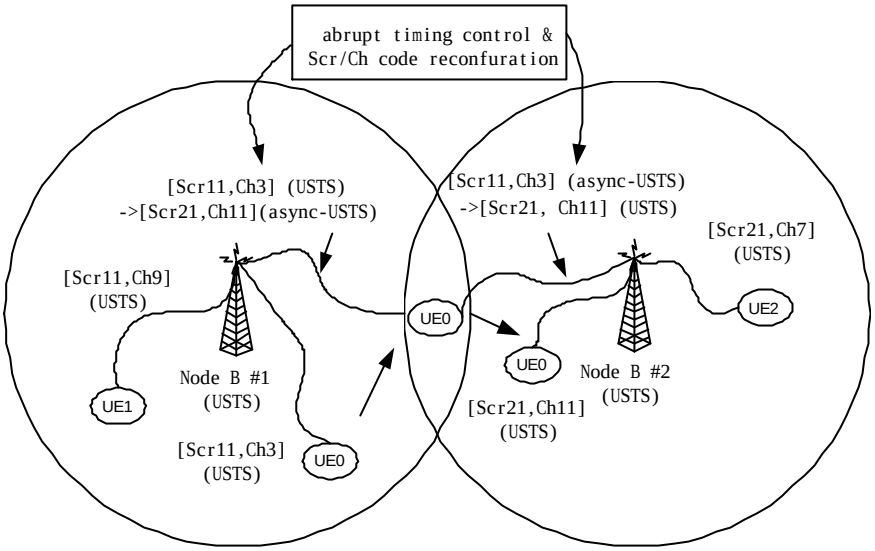

Figure 2.1 Two-way soft handover procedure for candidate c)

2.2 Considerations

The proposed handover provides a seamless USTS link to target Node B because the UE obtains better channel conditions during handover process. Comparing with the proposed scheme c) and the scheme b), there would be more interferences of a UE penetrating into target cell without being timing alignment by USTS in b). That is because the timing change of target Node B always occurs outside the handover region using b). In addition, such effects are more important in 3-way soft handover. For USTS to USTS transition like b) and c), we have to consider the change of timing for the target node B. The approach b) changes the timing of new USTS link and releases the previous link at the same time. However, the proposed handover c) performs the change of timing for both Node Bs and then releases the previous link, respectively. Therefore, the proposed handover c) may give more reliable performance, however complexity is expected to increase. If USTS to async-USTS transition in origin cell does not happen, then the scheme c) is very similar to b). Thus, the proposed c) is a more general handover.

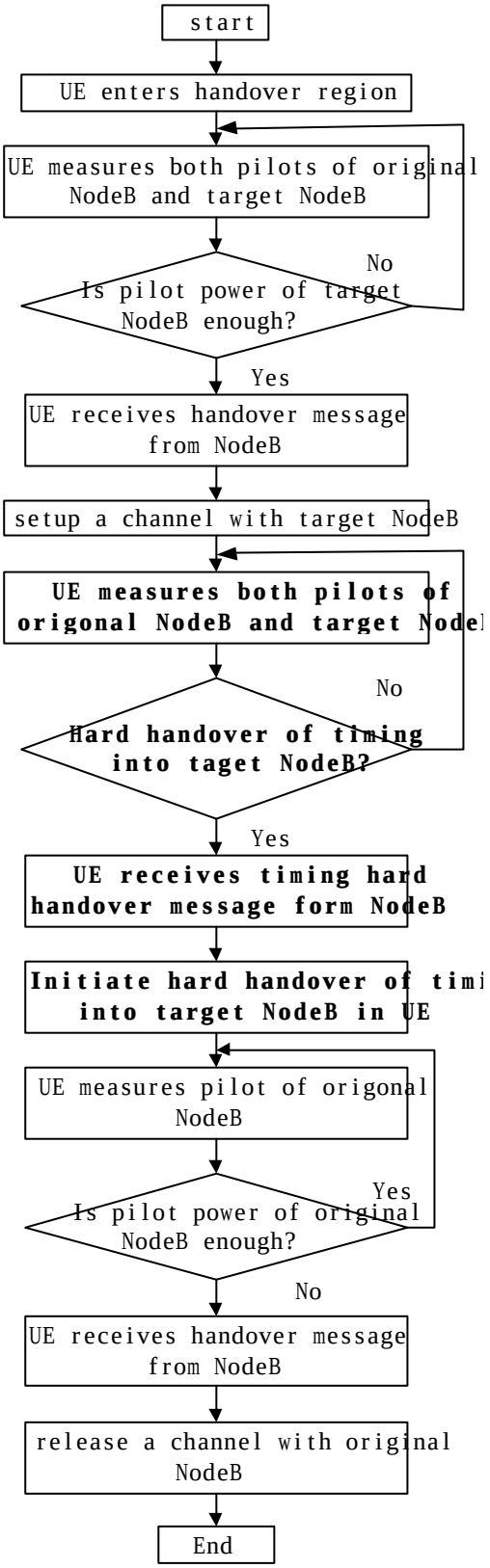

Figure 2.2 Flow chart of soft handover for candidate c)

3. Conclusions

We have proposed and discussed a handover scheme, which makes the change of timing inside of the handover region for USTS. Using this approach, the soft handover process becomes seamless and general, and reduces interferences to target cell. Therefore the proposed scheme gives more reliable handover performance.

4. References

[1] TSG WG1#16 R1-00-1263, Feasibility study on USTS, SK Telecom.

[2] TSG WG1#17 R1-00-1380, Study report for USTS, SK Telecom.

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