TSG-RAN Working Group 1 meeting #9 ***TSGR1#9(99)j87***
Dresden, Germany, Nov. 30 – Dec. 3, 1999

Agenda Item:
Source: **SK Telecom**
Title: **Initial synchronisation and CR for Initial synchronisation for USTS in 25.215**
Document for: **Discussion**

---

1. Introduction

The procedure for Uplink Synchronous Transmission Scheme (USTS) was accepted in text (in section 9 of TS25.214) at the last Kyongju meeting [1]. However it is required to elaborate the specification on the method of timing control for USTS in section 9 of TS25.214 which is the section for the procedure for USTS. This document have more detailed information on the method for Initial synchronisation for USTS and CR for Initial synchronisation in TS25.215.

2. Initial synchronisation for USTS

The transmission time control for USTS consists of two steps: Initial synchronization and tracking. We consider the Initial synchronisation in this document.

The amount of timing adjustment for Initial synchronisation is delivered through the message of higher layer. The unit of timing control is the minimum resolution which is dependent on oversampling rate for system or UE implementation, e.g., the unit of timing control step is 1/8chip for 8 times oversampling per chip.

The amount of timing control for initial synchronization (T_{INIT_SYNC}) is equal to the difference in time between the reference time of Node B and the time of recepteion of RACH as shown in Fig. 1.
The reference to the timing control for initial synchronization in UE is the time of reception of DPCH from Node B.
There are several offset times ($\tau_{DPCH,n}$) when Node B transmits DPCHs as shown in Fig. 2. Thus, the timing control for initial synchronization is practically carried out by $T_0 + \Delta T$ as shown in Fig. 2. and this value can be obtained with T_{INIT_SYNC}.

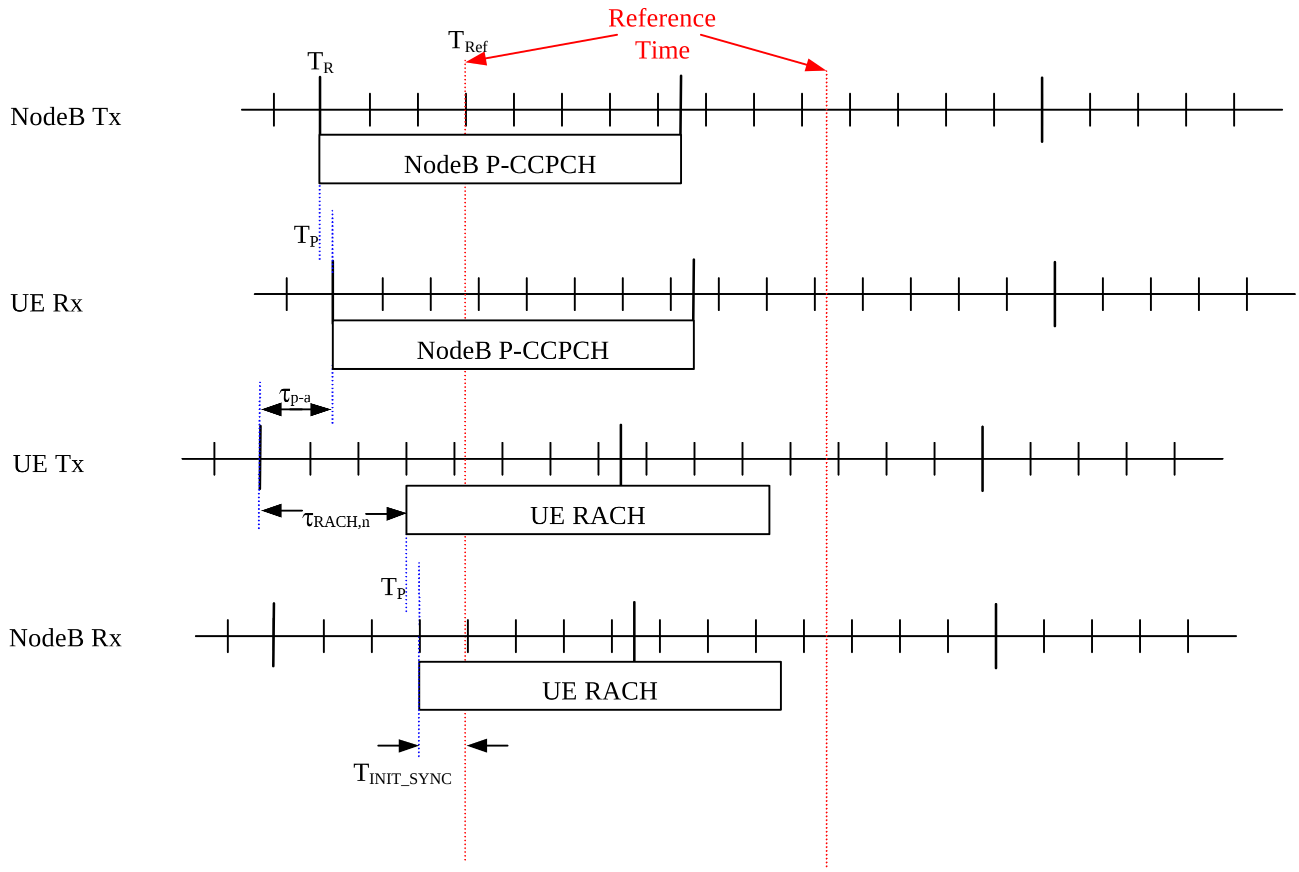

Fig. 1. The Initial Synchronization Time

- When AICH_Transmission_Timing is set to 0, then $\tau_{p\text{-}a}$ = 7680 chips
- When AICH_Transmission_Timing is set to 1, then $\tau_{p\text{-}a}$ = 12800 chips
- $\tau_{RACH,n}$: the difference in time between the start timing of #0 slot and that of selected access slot number

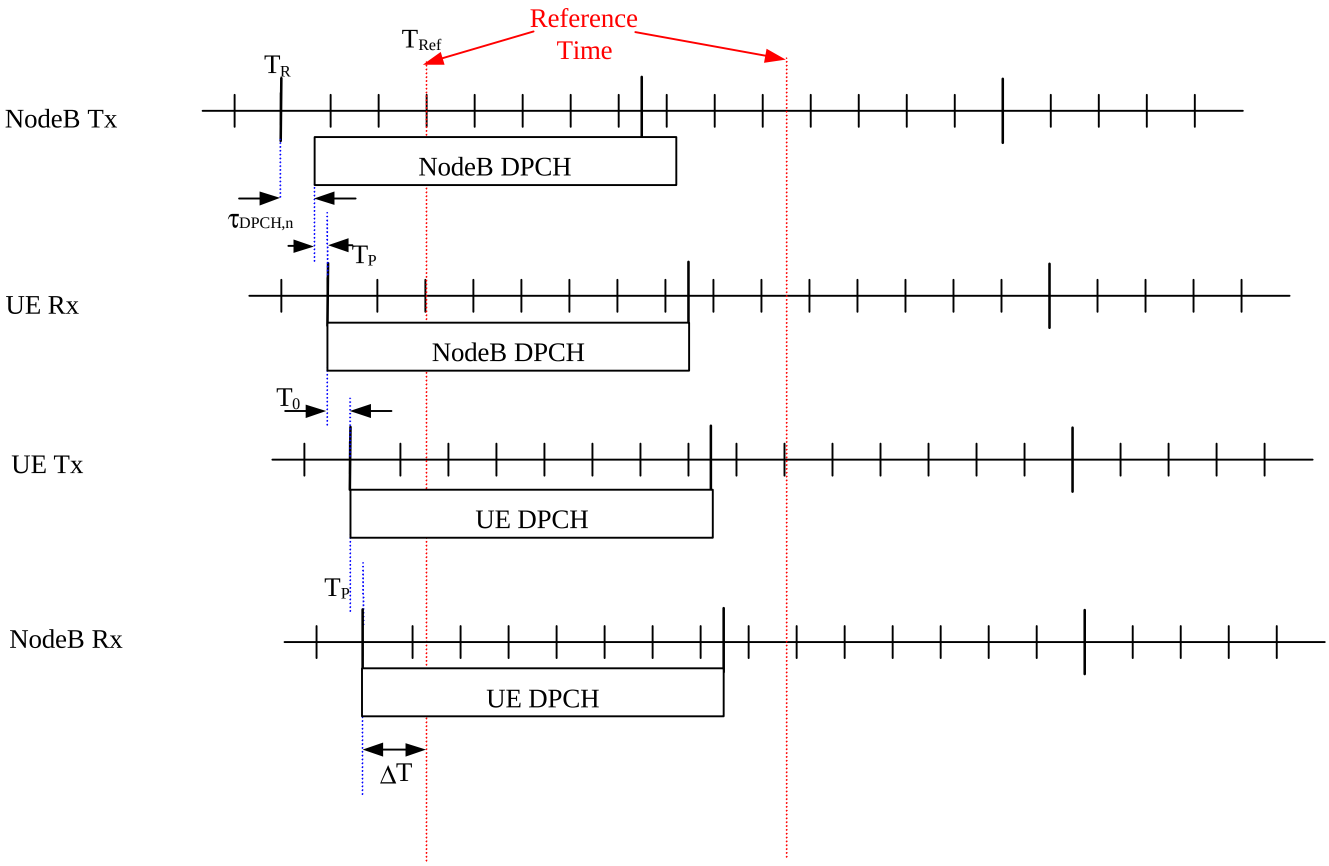

Fig 2. The timing control for Initial Synchronization

- The DPCH timing may be different for different DPCHs, but the offset from the P-CCPCH frame timing is a multiple of 256 chips, i.e. $\tau_{DPCH,n} = T_n \times 256$ chip, $T_n \in \{0, 1, \ldots, 149\}$.
- At the UE, the uplink DPCCH/DPDCH frame transmission takes place approximately T_0 chips after the reception of the first significant path of the corresponding downlink DPCCH/DPDCH frame. T_0 is a constant defined to be 1024 chips.

The time of transmission of the beginning of a uplink DPCH frame from a UE($T_{DPCH,Tx,UE}$) is written by

$$T_{DPCH,Tx,UE} = T_{DPCH,Rx,UE} + T_0 + \Delta T$$

From Fig. 1,

$$\begin{aligned} T_{INIT\_SYNC} &= T_{Ref} - T_{RACH,Rx,NodeB} \\ &= T_{Ref} - (T_R + 2T_p - t_{p-a} + t_{RACH,n}) \end{aligned} \quad (1)$$

From Fig.2, $\Delta T = T_{Ref} - (T_R + t_{DPCH,n} + T_0 + 2T_p)$ (2)

In equation (2),

$$\Delta T + T_0 = T_{Ref} - (T_R + 2T_p + t_{DPCH,n})$$

and T_{ref}-$(T_R$+$2T_p)$ is equal to T_{INIT_SYNC} +$\tau_{RACH,n}$ - τ_{p-a} from equation(1)

Thus, the transmitting timing is given by

$$
\begin{aligned}
T_{DPCH,Tx,UE} &= T_{DPCH,Rx,UE} + T_0 + \Delta T \\
&= T_{DPCH,Rx,UE} + T_{INIT\_SYNC} + t_{RACH,n} - t_{p-a} - t_{DPCH,n}
\end{aligned}
$$

where, $\tau_{RACH,n}$, $\tau_{p\text{-}a}$ and $\tau_{DPCH,n}$ are known values.

As a results, the UE sets the reference time($T_{DPCH,Rx,UE}$) at the time of reception of the beginning of a downlink DPCH frame from Node B and the amount of time offset for initial synchronization is equal to $T_{INIT\_SYNC} + t_{RACH,n} - t_{p-a} - t_{DPCH,n}$. The transmitting timing of DPCH from UE is

$$T_{DPCH,Tx,UE} = T_{DPCH,Rx,UE} + T_{INIT\_SYNC} + t_{RACH,n} - t_{p-a} - t_{DPCH,n}$$

3. References

[1] SK Telecom, “Uplink Synchronous Transmission Scheme,” TSGR1#7 (99)e68

3GPP TSG RAN WG1 Meeting #9
Dresden, Germany, Nov 30 – Dec 3, 1999

Document R1-99j87
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.215	**CR**	**018**	Current Version:	3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑   *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN #6	for approval	X	Strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG   *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME	X	UTRAN / Radio	X	Core Network	

Source: SK Telecom   **Date:** 1999-11-26

Subject: Measurements for USTS

Work item:

Category:				**Release:**		
	F	Correction			Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature	X		Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: The additional descriptions are required to support the measurements for USTS.

Clauses affected: 5.2.8

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments:

5.2.8 Initial Synchronization Time

Note: This measurement is required to support USTS described in section 9 of TS25.214.

Definition	The difference in time between the reference time and the time of reception of the beginning (the first significant path) of the RACH from the UE. Note: The definition of "first significant path" needs further elaboration.
Range/mapping	Range of [-(38400*Oversamples*(T_{Ref}-10)/10-1), 38400*Oversamples *T_{Ref}/10)], given in [1/oversamples] chip units, where the unit of T_{Ref} is msec.