3GPP TSG RAN WG3 *TSGR3#7(99)B96*
Sophia Antipolis, 20-24 Sept. 1999

Source: Siemens, Italtel

Title: Timing Advance for TDD

Agenda Item: 14.1, 14.2
Document for: Approval, Inclusion in 25.427, 25.435

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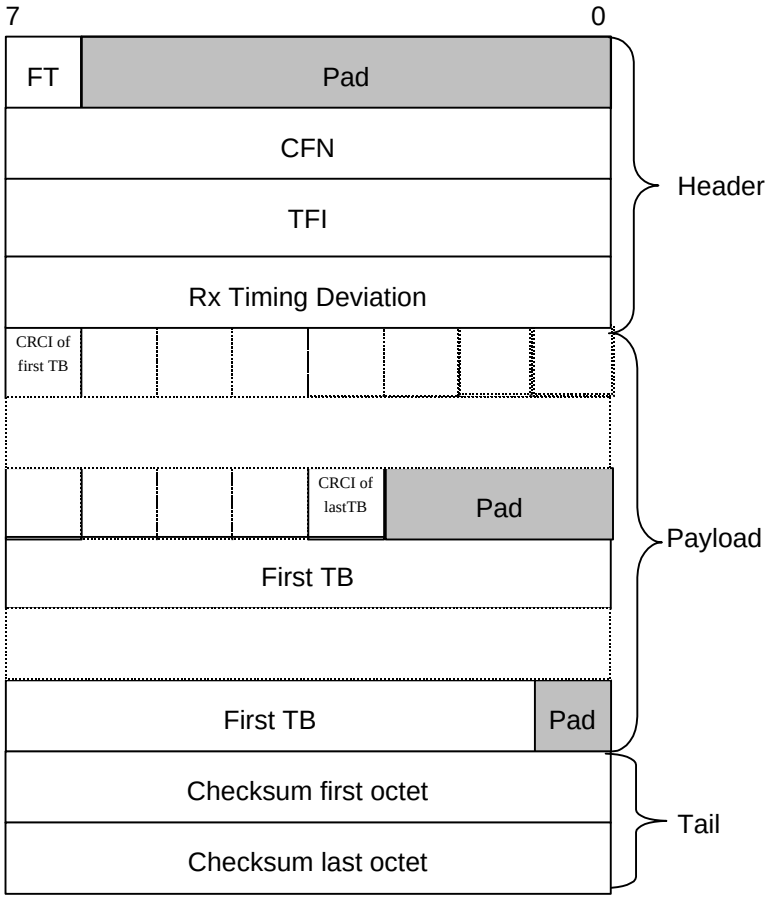
1. Introduction

The Timing Advance mechanism for UTRA TDD mode, as described in [1], has been approved by RAN WG2, and the corresponding changes for the RAN WG2 specs according Tdocs [2], [3], and [4] have been agreed. This paper (which is an update of [5]) proposes the changes of the Iub and Iur Frame Protocols for the Uplink transport channels RACH, DCH, and USCH, which is required as part of the timing advance mechanism.

2. Iub RACH data frame

As described in [1], the NodeB Layer 1 must be able to measure the timing deviation of the received RACH bursts in TDD cells, and to report this together with the received RACH Transport Blocks within the Iub RACH data frame to the CRNC, such that in a potential subsequent DCH or USCH channel allocation to the UE, the UTRAN can include the corresponding timing advance command.

For this purpose, it is proposed to include the "Rx Timing Deviation" (as it has been called in RAN WG1) in the RACH Frame structure presented in TS 25.435 [6], as follows:



The meaning of the new field „Rx Timing Deviaton" is the following:

- **Rx Timing Deviation:**
  Description: Optional field, applicable for TDD, includes measured Rx Timing Offset as a basis for timing advance.
  Value range: {0-255}.
  Field Length: 8 bit

3. Iur RACH data frame

The RACH Iur data frame needs the additional Rx Timing Deviation field, too, to allow forwarding of the measured value to the SRNC, together with the RACH payload. Therefore the Iub RACH/FACH data Frame structure, presented in [7], should be changed as follows (the new parameter is shown in *italic*):

	Information element	**Description**	**Present on**	
			RACH UL	**FACH DL**
Header	Frame Type	RACH/FACH data frame	X	X
	DRNTI/SRNTI	Used to identify the UE context in the CRNC/SRNC	SRNTI	DRNTI
	FACH Indicator	Indicates if the data in the payload should be sent on the FACH coupled to the RACH (i.e. the payload contains the Cell Update Confirm message), or if it can be sent on a different FACH decided by the CRNC (subsequent user data).		X
	Priority Indicator	Priority indicator corresponding to logical channel type. Used by the CRNC to place the payload in the correct transmit buffer.		X
	Rx Timing Deviation (TDD, optional)	*Measured RACH burst receive timing deviation*	X	
	Length	Length of the data field	X	X
Payload	Checksum indicator	See ref. [4] TS 25.427	X	
	Data	Contains the MAC-c SDU to be sent over the radio interface.	X	X
Tail	Data frame checksum	See ref. [4] TS 25.427	X	X

Note that the RACH/FACH FP does not facilitate multiplexing of data streams from different UEs onto the same data frame, but does allow multiple UEs to share the same transport bearer.

4. Iub/Iur DCH control frame

In case of Uplink DCH channels, it s proposed to send Rx Timing Deviation measurement reports in UL DCH control frames. The measurement report shall be sent periodically for a UE, provided the Timing Deviation threshold is above a certain tolerable limit. The NodeB shall apply this measurement policy to all the UL Radio Links, if ordered to do so by O&M command.

The DCH Control frame, presented in [8], should be enhanced as follows:

	Information element	**Description**	**Valid On**	
			UL	**DL**
Header	Frame Type	DCH Control Frame	X	X
	Rx Timing Deviation (TDD)	Optional measurement report for TDD DPCH bursts	X	
Payload	NAME	Name of command or measurement report	X	X
	Parameters	Parameters of the command or measurement report	X	X
Tail	DCH control frame checksum	Checksum of the header and payload data	X	X

The Information Element is defined as follows:

Rx Timing Deviation (TDD)

Description: Measured UL DCH Timing Deviation for TDD, optional.
Value range: {0-255}
Field length: 8 bits

5. Iub USCH Data frame

In this UE state, it is necessary that the Rx Timing Deviation of the received USCH bursts is measured by the NodeB, and reported to the CRNC.

This can be achieved by including a suitable Information Element in the Iub USCH Data Frame.

	Information element	**Description**
Header	Frame Type	Data Frame
	FN_{CELL}	Indicates the Cell Frame Number count when the USCH was received.
	Transport Format Indicator	The TFI to denote the format of the Transport Block set carrying the USCH payload.
Payload	Transport Block Set	Data from the Radio interface
	Rx Timing Deviation (option for TDD)	Reports the measured Rx Timing Deviation of the UL bursts
Tail	Data frame checksum.	Checksum of the header and payload

Proposal for Iub USCH Data Frame structure.

Since in the "Standalone" USCH scenario, the NodeB does not know which UE currently uses the USCH, the NodeB can not send a Dedicated Measurements Report as NBAP message to the RRC. A "Common Measurement" will not be sufficient because the timing association between the received USCH Transport Block, and the Rx Timing Deviation, can not be reported sufficiently accurate. Therefore it is proposed to include the Rx Timing Deviation within the Iub USCH Data Frame.

In case of USCH, the Timing Advance procedure is performed as part of the USCH Physical Resource allocation procedure, by the RRC etity in the CRNC. So there is no need to include the Rx Timing Advance measurement report in the Iur USCH data frame.

5. Proposal

It is proposed to include the above specified RACH and USCH Iub and Iur Data Frame structures, including the Rx Timing Deviation Information Element, into the Iub and Iur Common Transport Channel specifications [6], [7], and the updated DCH Control Frame structure in [8].

References:

[1] 3GPP TSG RAN WG2 Tdoc R2-99849, Description of the Timing advance mechanism for TDD, Source: Siemens
[2] 3GPP TSG RAN WG2 Tdoc R3-99850, Proposal for changes in 25.302 for Timing Advance
[3] 3GPP TSG RAN WG2 Tdoc R3-99850, Proposal for changes in 25.321 for Timing Advance
[4] 3GPP TSG RAN WG2 Tdoc R3-99850, Proposal for changes in 25.322 for Timing Advance
[5] 3GPP TSG RAN WG3 Tdoc R3-99960, Timing Advance for TDD.
[6] 3GPP TS 25.435 v.0.4.1, Iub Interface User plane protocols for Common Transport Channel data streams.
[7] 3GPP TS 25.425 v.0.2.3, Iub Interface User plane protocols for Common Transport Channel data streams.
[8] 3GPP TS 25.427 v.0.4.1, Iub/Iur User plane protocol for DCH.