

Agenda Item: 5.4
Source: SK Telecom
Title: Uplink Synchronous Transmission Scheme
Document for: Discussion

1. Introduction

Uplink Synchronous Transmission Technique was adopted as an optional techniques for low mobility UE in ARIB Volume 3 and has been discussed in ETSI layer 1 expert meetings[1][2]. But it has not been accepted in text and as a pending item, which is described in section 9. In this document, we propose the refined text for further discussion.

Major changes from the previous description are;

- channelization code assignment method for reducing Peak to Average power Ratio [3].
- scrambling code generation method
- revision of the text and fix the undefined parameters.

2. Text Proposal

9 ~~UplinkReverse link~~ synchronous transmission

<Editor's note: This clause is only to be found in ARIB Volume 3. Some more discussion on this technique is probably needed, and for now the original text is kept. The physical layer procedures of RSTS needs to be identified and further refined and described in this clause.>

9.1 General

~~UplinkReverse Link~~Synchronous Transmission ~~Scheme~~(URSTS) ~~is an alternative technology applicable for low mobility terminals.~~ USTS can reduce ~~reverse up~~link intra-cell interference by means of making a ~~cellnode-B~~ receive orthogonalized signals from UEs ~~in the cell~~. To orthogonalize receiving signals from UEs,

- the same scrambling code is allocated to all dedicated physical channels in ~~a the~~ cell,
- different ~~channelization orthogonal spreading~~ codes are allocated to all dedicated physical channels across all UEs ~~in a cell in the cell~~, and ~~the spreading factor and code number of channelization code are delivered from network to each UE~~
- ~~the channelization codes for DPDCH and DPCCH in a UE are chosen from either upper half part or the lower half part of the OVSF code tree in a UE to reduce peak to average power ratio,~~
- ~~additional scrambling codes can be allocated if all channelization codes are occupied, and~~
- the signal ~~transmissionarrival~~ time of each UE is adjusted.

The ~~spreading and~~ modulation scheme ~~for according to RUSTS~~ is ~~same as section 4 of TS 25.213 described in <update 3.2.4.2.1.2.2>~~. In case of USTS, the long scrambling code described in section 4.3.2.2. of TS 25.213 is used. However, this long scrambling code is not UE specific, but cell specific. In order to generate the cell specific long scrambling code, the initial loading value of PN generator is ~~determined by the network~~

~~The channelization codes are Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between USTS uplink channels of different rates and spreading factors. The timing control procedures are described later in this section. RSTS is an alternative technology applicable for low mobility terminals. A system mainly accommodating low mobility terminals may adopt the RSTS.~~

The transmission time control is carried out by two steps. The first step is initial synchronization and the second is tracking.

- 1) Initial synchronization: Adjust transmission time through the initial timing control message over FACH
- 2) Tracking Process (Closed Loop Timing control): Adjust the transmission time through the Time Alignment Bit (TAB) over ~~D~~FPCCH.

~~Since the timing control is carried out at much lower rate than TPC, TAB replaces the TPC bit every timing control period of 20 msec. (In the exemplary embodiment, the timing control period equals to the frame length or multiples of it. In case of the example of timing control every frame, and the lastfirst TPC bit of every two each frames is replaced by TAB)~~

- At the UE, ~~hardsoft~~ decision on the TAB shall be performed, and when it is judged as "0", the transmission time shall be delayed by ~~1/4 (or 1/8)~~ chip, whereas if it is judged as "1", the transmission time shall be advanced by ~~1/4 (or 1/8)~~ chip.

9.4 Reference time

~~The reference time of cell is set up at even numbered frame starting timing plus half slot duration.~~

~~The reference time is set up at the starting point of forward link frame plus the median value between minimum and maximum round trip delay within a cell. < Editor's note: How can one take the median of two values? >~~

3. References

- [1] TTA, "Reverse Link Synchronous Transmission Scheme," Tdoc SMG2 UMTS-L156/98
- [2] TTA, "Text Proposal for Uplink Synchronous Transmission Scheme," Tdoc SMG2 UMTS-L1 410/98
- [3] ETRI, "Channelization code assignment for RSTS" TSGR1#5(99)581