TSG-RAN Working Group 1 meeting #7 *TSGR1#7(99)b34*
30th August - 3rd September 1999, Hanover, Germany

Agenda Item : **Ad hoc 14**
Source : **Philips**
Title : **Update of FAUSCH scheme and text proposal (MODIFIED FOR 15 SLOTS)**
Document for : **Approval**

INTRODUCTION

Given the changes which have occurred within L1 since the original acceptance of FAUSCH within 3GPP, the description currently in the specifications is no longer applicable. In Tdoc R1(99)823 we proposed two possible updates of the FAUSCH scheme to take into account the changes to the RACH. In the physical meeting of ad hoc 14, during TSG-R1 #6, it was indicated that scheme 2 was preferred as the update of FAUSCH, and proposed that the text in Tdoc R1(99)823 should be inserted into the specifications, with minor modifications due to the harmonisation changes. Since the results of ad hoc 14 were unable to be discussed in the plenary, due to time constraints, in this paper we provide a summary of scheme 2, together with the modified text proposal.

DESCRIPTION OF UPDATED FAUSCH SCHEME

In this scheme we propose to allocate a new physical channel for the FAUSCH, to be run in parallel with the PRACH. In the absence of any better suggestions, we propose to call this channel the PFAUSCH. The PFAUSCH will run with the same timing and slot structure as the PRACH (15 PFAUSCH access slots in two frames), and also the same spreading and modulation (4096 Long Code). FAUSCH transmissions on the PFAUSCH will consist of a signature containing a 16 bit preamble spread by the 4096 Long Code. Since the correlation properties of the new RACH preambles are better than those previously specified, it is felt that the use of only a single preamble for FAUSCH is no longer necessary to preserve performance. Instead, it is proposed to use all 16.

Each PFAUSCH access slot is divided into 19 fast access slots, each of length 256 chips, plus an initial guard period of 256 chips. All 16 FAUSCH preambles may be assigned in parallel in each fast access slot. Within a PFAUSCH access slot, a UE is assigned a unique combination of preamble and fast access slot, collectively known as a fast access identifier.
For fast access identifier #i, within a particular PFAUSCH access slot, the assigned fast access slot is given by int(((i-1)/16)+1), and the preamble is (i-1)mod16 + 1.

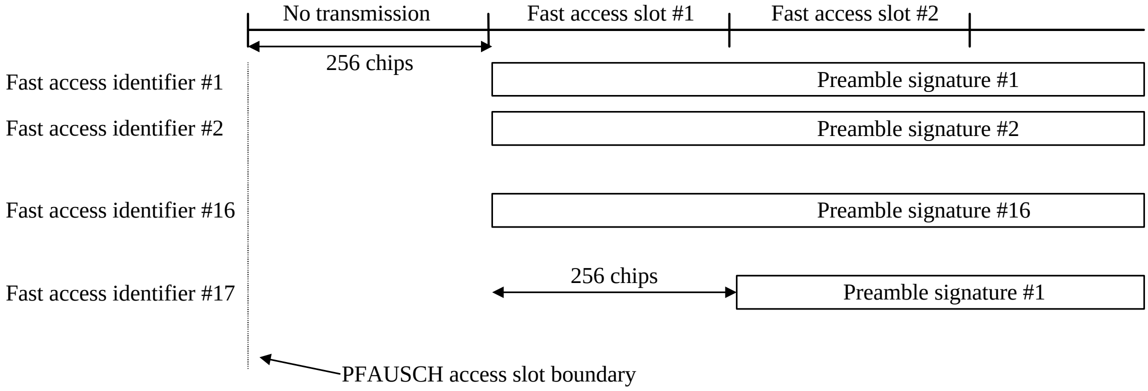

Figure 1. PFAUSCH used for FAUSCH fast access identifiers.

Given the 4096 Long Code spreading, it is possible to run the PFAUSCH in parallel with the PRACH without significant mutual interference. The 256 chip guard period at the start of slots within the PFAUSCH ensures that there is no confusion likely between RACH and FAUSCH access attempts utilising the same signature. In this way, a PFAUSCH can be directly overlaid onto a PRACH with no impact on the operation, dimensioning and planning of the RACH (including ramping), whilst all slots can also be used for FAUSCH, giving maximum capacity and flexibility.
Should 256 chips not be sufficient to ensure isolation of RACH and FAUSCH in large cells (>10km radius for 3.84 Mchip/s), fast access identifiers can be allocated only in those fast access slots which would not interfere (e.g. use of only the even fast access slots #2,4,.. would give 512 chip separation).

CONCLUSIONS AND RECOMMENDATION

The updated FAUSCH scheme makes use of opportunities provided by the structure of the new RACH to improve the FAUSCH. By separating the PRACH and the PFAUSCH we are able to expand the capacity of the FAUSCH, whilst suffering no reduction of RACH capacity by the addition of any FAUSCH. This also simplifies planning matters, as FAUSCH slots can be added/removed at will regardless of the RACH traffic. It is therefore recommended that this scheme is adopted for use within 3GPP, and the attached text is inserted into the relevant documents, as proposed in ad hoc 14.

Text Proposal for updated FAUSCH scheme

In document TS 25.211

5.2.2.1 Remove section in [].

5.2.2.1.4 Remove

5.2.2.1.5 Remove

5.2.2.3 Physical Fast Uplink Signalling Channel

The Physical Fast Uplink Signalling Channel (PFAUSCH) is used to carry the FAUSCH.

5.2.2.3.1 FAUSCH transmission

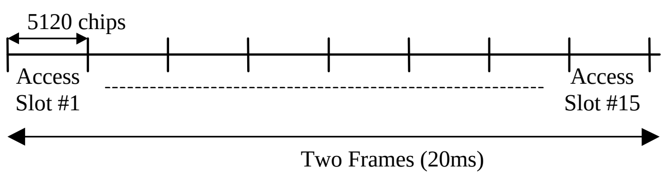

Figure 5: PFAUSCH access slots

The PFAUSCH consists of 15 access slots, offset in time, by multiples of 5120 chips, from the boundary of every second frame of the received BCH of the current cell. Information on what access slots are available within the current cell is broadcast on the BCH.

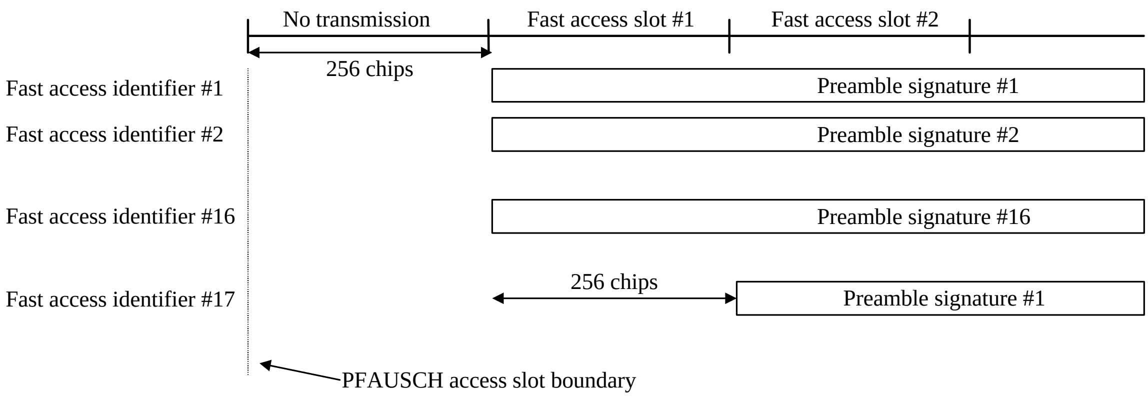

Figure 5: PFAUSCH used for FAUSCH fast access identifiers.

The Fast Uplink Physical Channel (FAUSCH) is based on the transmission of signatures of length 16 complex symbols ±(1+j). The signatures are the same set of signatures used for the RACH preamble. The signatures are spread with a 4096 Long Code, as per the RACH. A *fast access identifier*, comprising a unique combination of signature and time slot, together with a PFAUSCH access slot number, may be allocated to the UE by the network when entering Connected Mode, but the allocation may be updated with appropriate signalling.
For fast access identifier #i, within a particular PFAUSCH access slot, the assigned fast access slot is given by int(((i-1)/16)+1), and the preamble is (i-1)mod16 + 1.
To avoid the possibility of collisions, only one UE is allowed to transmit with a given signature in a particular time slot. Thus the UE can start the transmission of the FAUSCH at an assigned time offset relative to the boundary of the PFAUSCH access slot. The different time offsets are denoted *fast access slots* and are spaced 256 chips apart as illustrated in Figure 5. To avoid possible confusion of transmissions from different UEs, the separation between allocations of fast access slots to different UEs with the same

signature must be sufficient to allow for any round-trip delay resulting from the physical distance between network and UE. Therefore the allocation of fast access slots may be limited by the network to a subset of those available, depending on the deployment scenario.

6 Mapping of transport channels onto physical channels

Figure 25:

Transport Channels	Physical Channels
BCH	Primary Common Control Physical Channel (Primary CCPCH)
FACH	Secondary Common Control Physical Channel (Secondary CCPCH)
PCH	
RACH	Physical Random Access Channel (PRACH)
FAUSCH	Physical Fast Access Signalling Channel (PFAUSCH)
CPCH	Physical Common Packet Channel (PCPCH)
DCH	Dedicated Physical Data Channel (DPDCH)
	Dedicated Physical Control Channel (DPCCH)
	Synchronisation Channel (SCH)
DSCH	Physical Downlink Shared Channel (PDSCH)
DSCH control channel	Physical Shared Channel Control Channel (PSCCCH)
	Acquisition Indication Channel (AICH)
	Page Indication Channel (PICH)

In document 25.213

4.3.4 Fast uplink signalling codes

4.3.4.1 Preamble spreading code

Spreading of the FAUSCH preamble is carried out in the same way as for the RACH (4.3.3.1 RACH preamble spreading code).

4.3.4.2 Preamble signature

FAUSCH preamble signatures are the same as those specified for the RACH (4.3.3.2 RACH preamble signature).

<Note: 4.3.4.1 and 4.3.4.2 may need to be rewritten depending on the exact text produced for the relevant RACH sections>

In document 25.214

4.x PFAUSCH synchronisation

<section to follow 4.4 PRACH synchronisation. No text prepared at this time>

5.1.x PFAUSCH

<section to follow 5.1.1 PRACH on PFAUSCH Power control. No text prepared at this time>

x FAUSCH procedure

<New section "FAUSCH procedure" to be added between sections 6 Random access procedure, and 7 Transmission stop and resumption control. No text prepared at this time.>