3GPP TSG RAN WG1 Meeting #7 ***TSGR1#6(99)b35***
August 30-September 3 1999, Hanover, Germany

Agenda item:	**Ad hoc 14**
Source:	**Philips**
Title:	**Fast Layer 1 acknowledgment for FAUSCH**
Document for:	**Approval**

Summary

This document proposes modifications to the AICH to achieve fast Layer 1 acknowledgment for the FAUSCH in FDD mode.

Discussion

Whilst the benefits of FAUSCH for fast, collision free, uplink signalling are well known, it is also apparent that the delay performance of the FAUSCH is constrained by the requirement for acknowledgment via L2/3 signalling on the FACH. Although this constraint is not as limiting on the FAUSCH as it would be on the RACH, it is still beneficial to have fast L1 based acknowledgment for the FAUSCH. This would allow, for example, power ramping on a frame by frame basis, since acknowledgment would be available in the same frame as the uplink request.

At TSG-R1 #6, Ad Hoc 14 recommended the adoption of scheme 2 from Tdoc R1-99823, which gives us the PRACH and PFAUSCH structures given in Figure 1.

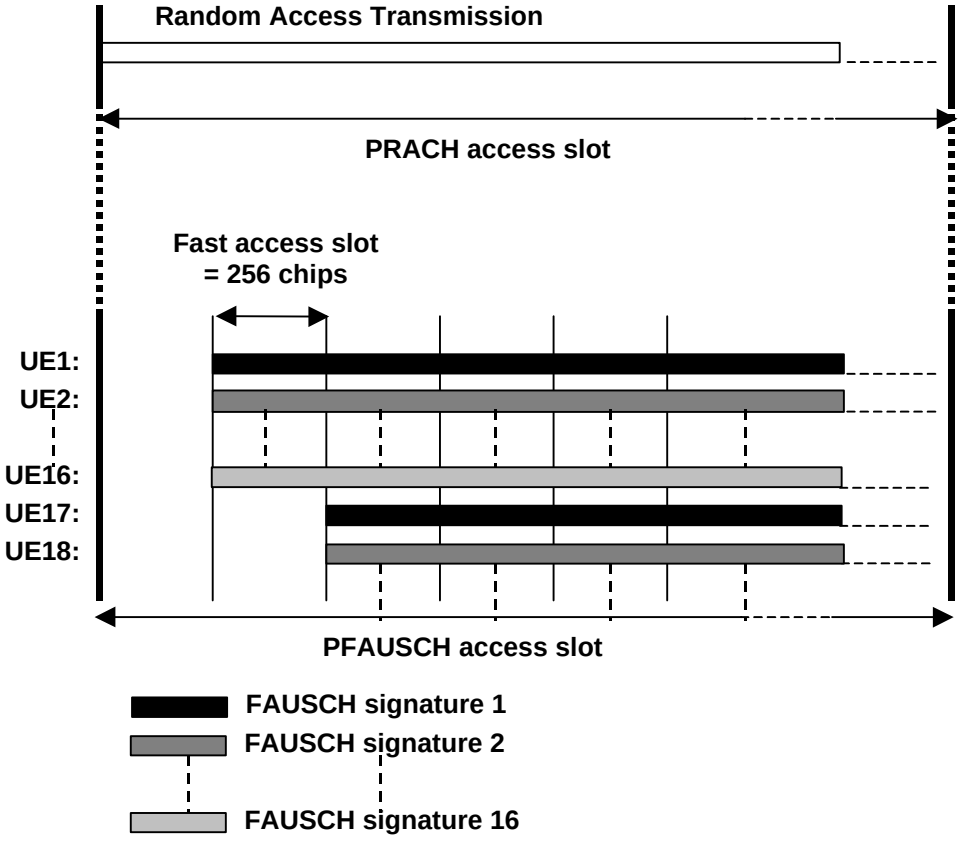

Figure 1. Transmission structures of the PRACH and PFAUSCH.

In this document we propose the addition of a time shifted structure to the AICH, in order to achieve fast layer 1 acknowledgement for the FAUSCH, as shown in Figure 2.

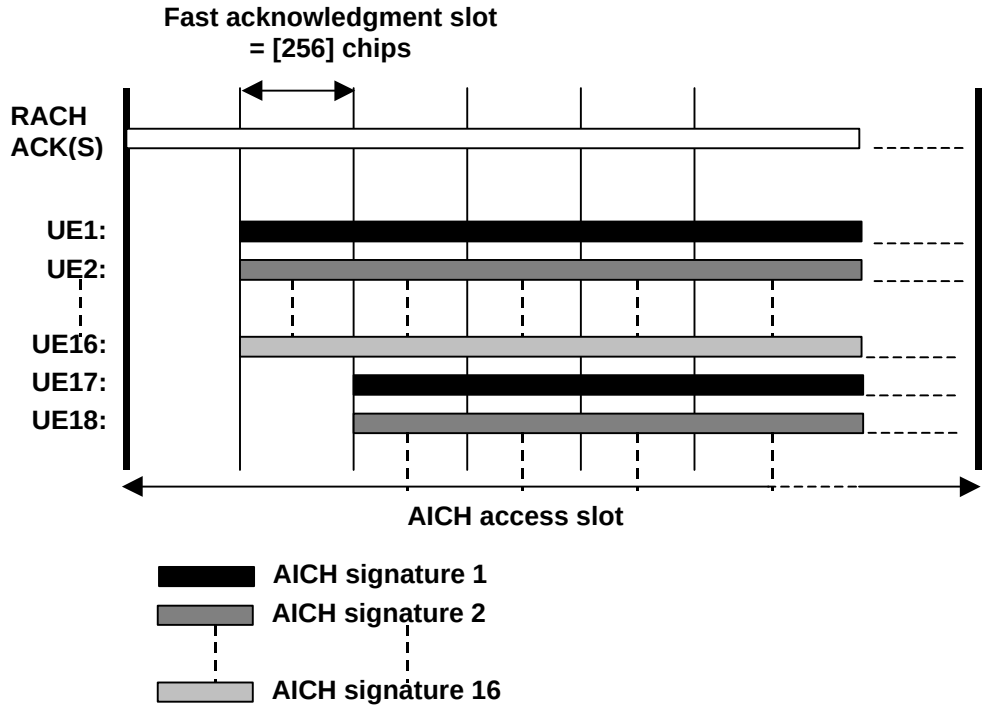

Figure 2. Transmission structure of the AICH.

The AICH signatures consist of a 16 symbol preamble which has 256 chip spreading, plus scrambling, applied to generate a 4096 chip sequence. Since this is a downlink transmission the relative timing and power of the signatures can be optimised, and the 256 chip spacing of fast acknowledgement slots maintains the orthogonality of the spreading code.

It has also been proposed, in Tdoc R1-99644 that the AICH could operate using an 8 (complex) symbol preamble, and 512 chip spreading. In this case the time offset of fast acknowledgement slots would be extended to 512 chips. This would cause a halving of the AICH capacity for FAUSCH, but if this was a problem, as second 512 spreading code could be allocated to operate in parallel with the existing code, with no extra use of code resource compared to the 256 chip spreading case. If the extra code was not required, there would be an overall reduction in use of code resource by using the 512 chip spreading.

Recommendation

We recommend that fast acknowledgement of FAUSCH transmissions is provided via the AICH, to give improved performance of the FAUSCH.

TEXT PROPOSAL

Proposal for 25.211, Section 5.3.3.7

5.3.3.7 Acquisition Indication Channel (AICH)

The Acquisition Indicator channel (AICH) is a physical channel used to carry Acquisition Indicators (AI). Acquisition Indicator AI_i corresponds to signature *i*, see further 25.213, Section 4.3.3.2

Figure 1 illustrates the frame structure of the AICH. Two AICH frames of total length 20 ms consist of 15 *access slots* (AS), each of length 20 symbols (5120 chips). Each access slot consists of ~~two parts, an *Acquisition Indicator* (AI) part and an empty part.~~20 fast acknowledgement slots (spaced by 256 chips), within each of which there is an AI part.

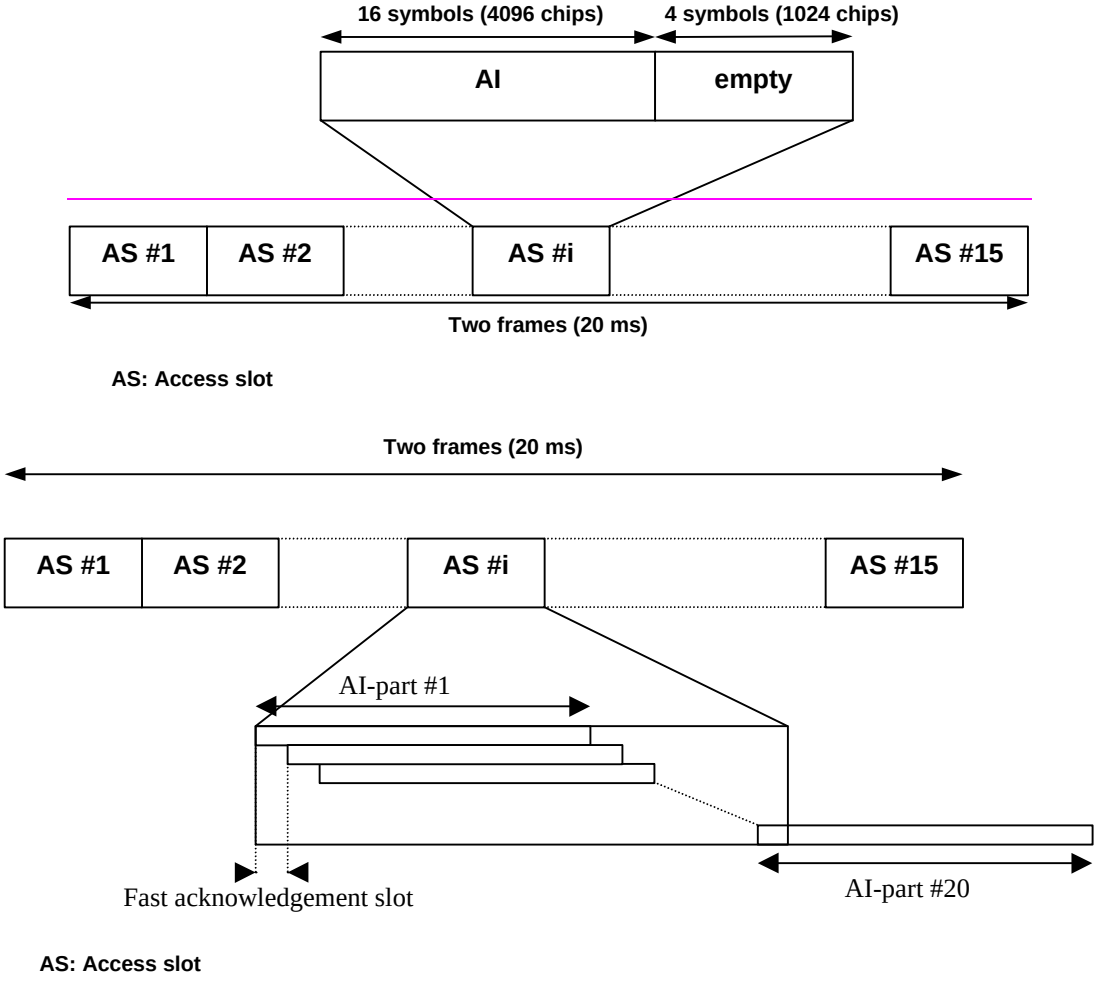

Figure 1: Structure of Acquisition Indicator CHanel (AICH)

Figure 2 illustrates the detailed generation of an AICH ~~access slot~~AI part. Note that Figure 2 shows an example implementation.
~~The~~ AI-part~~s~~ of the access slot consist~~s~~ of the symbol-wise sum of up to 16 orthogonal code words w_1-w_{16}, multiplied by the value of the corresponding acquisition indicator AI_i. The orthogonal code words w_1,...,w_{16} are shown in Table n.
~~The empty part of the access slot consists of 4 zeros.~~
The phase reference for the AICH is the CPICH.

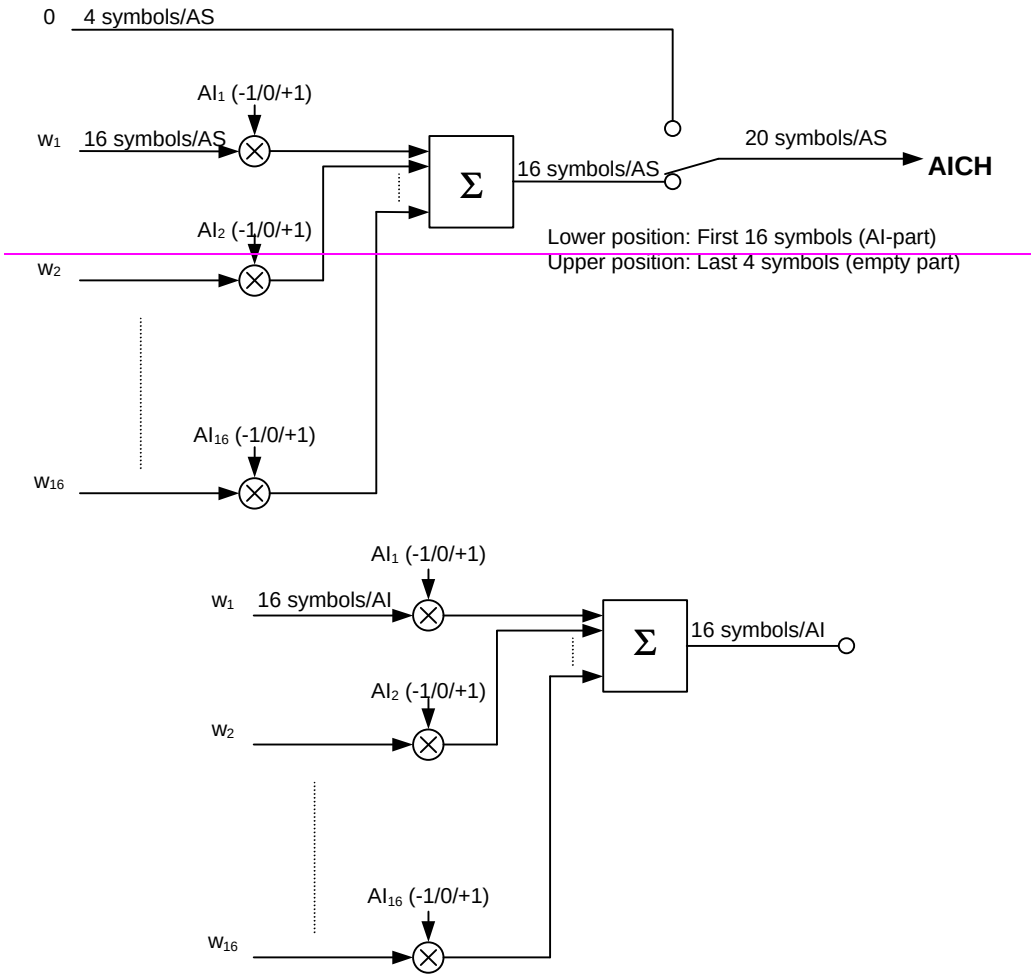

Figure 2:Schematic generation of AICH ~~access slots~~AI part.