3GPP TSG RAN WG1 Meeting #5 ***TSGR1#5(99)547***
1-4 June 1999, Cheju, Korea

Source: **Philips**

Title: **Support for FAUSCH in TDD mode**

Agenda item:

Document for: **Discussion**

Summary

The Fast Uplink Signaling Channel (FAUSCH) has been accepted by TSG RAN WG2 for FDD mode, and this channel can be supported by a small modification to the PRACH (Physical Random Access Channel). Here we propose a similar approach for the TDD mode.

Discussion

The advantage of the FAUSCH approach compared to RACH is that delays due to collisions are avoided. Also the overhead of FAUSCH in the uplink is much smaller than RACH, since there is only a single bit message and no payload.

In TDD mode, we could consider supporting FAUSCH by transmission of long pre-amble sequences like in FDD mode. However, because of the time slot structure, the number of uplink slots may be limited. In addition the uplink slots may not be contiguous. Confining pre-amble transmissions within a slot allocated to DCH or RACH may also cause unacceptable interference.

Therefore we propose that if FAUSCH is used in a given cell, at least one slot is allocated exclusively for this application. Thus, if the RACH is heavily loaded, then additional uplink packet transmission can be supported using FAUSCH.

Proposals

We suggest that the PRACH (shown in Figures 1 and 2) is extended to allow for mid-amble transmission with no associated message part. A number of fast access slots can be created within a slot.

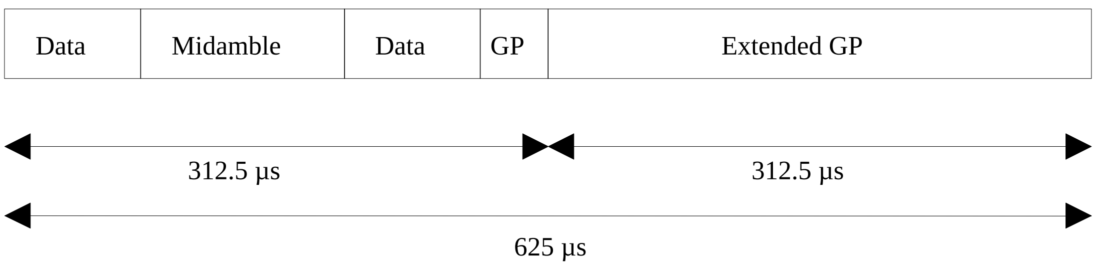

Figure 1: PRACH Access Burst 1

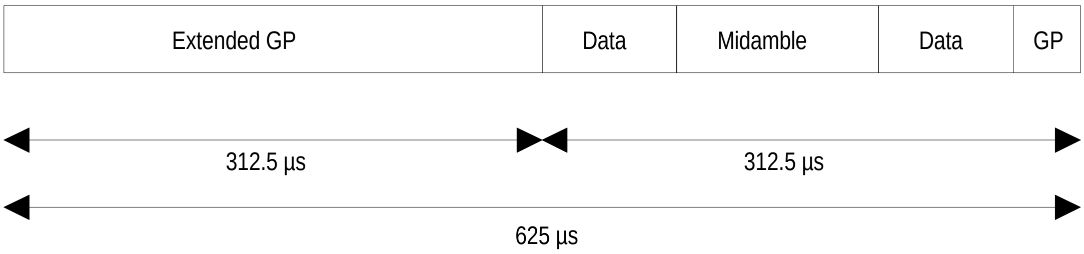

Figure 2: PRACH Access Burst 2

We now consider two possible solutions:

Option 1

First we apply the constraint that the mid-ambles do not overlap We propose that the mid-amble length is 256 chips, and which allows up to 10 fast access slots per 625us slot, or 9 with a guard period, as shown in Figure 3. Although this mid-amble length is shorter than used for RACH access bursts, the additional implementation complexity will be minimised if it is made the same as the mid-amble for traffic burst type 2.

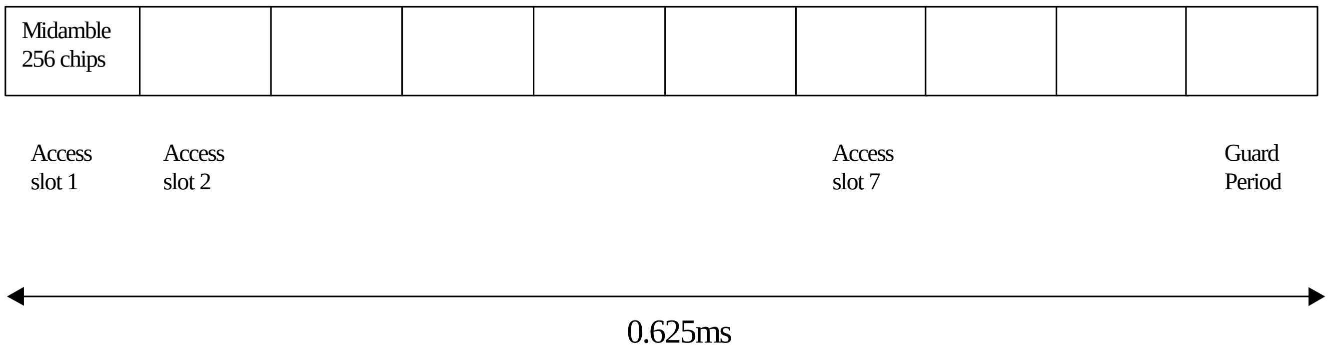

Figure 3: PRACH Access Burst for FAUSCH (non-overlapping)

Initial consideration of the required energy for successful access suggests that at least 8 codes per fast access slot could be detected reliably. This would give a total of 72 fast access slots for one slot, which represents the number of users which could be supported. Clearly, rather fewer fast access slots can be allocated than in FDD mode, which implies that they should be reserved for the most active UE’s, for example at least some of those using the USCH.

Option 2

This option more closely resembles the FAUSCH support provided in FDD mode, as shown in Figure 4. The mid-amble length is 512 chips (the same as for the RACH burst), but the transmissions are allowed to overlap. To simplify the receiver only one of the RACH mid-amble sequences is used. This could be selected on the basis of its auto-correlation properties.

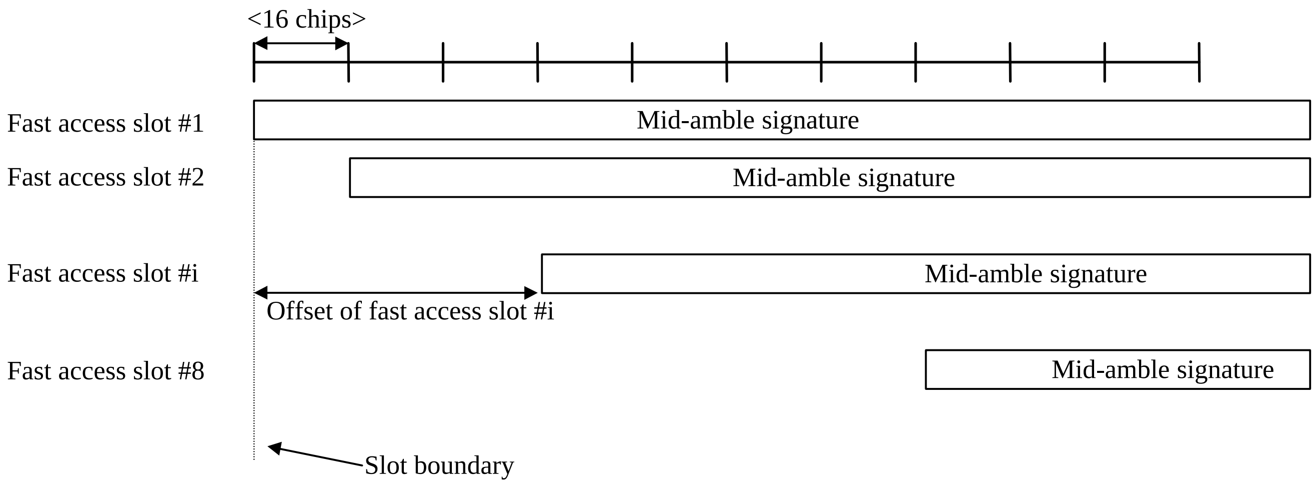

Figure 4: PRACH Fast Access Bursts for FAUSCH (overlapping)

A minimum separation of <16> chips is proposed between fast access slots. The actual value used may be cell specific. Allowing for a guard interval of 96 chips at the end of the slot, we have space for up to 123 fast access slots. Implementation complexity is low since only a single matched filter is needed in the receiver.

For both options, the possibility of using additional codes could be considered. The feasibility of this may depend on the channel conditions and deployment scenario.

Conclusion

We prefer option 2 because it offers greater capacity.

If either of these proposals are considered of interest, then a text proposal can be drafted.