CPCH Status Broadcast

background and motivation for R1#9(99)j18

Motivation

- If status information is available, the UE only requests a CPCH when one is available
  - Reduces uplink interference
  - Reduces packet delay
  - Improves efficiency of channel occupancy
- Regular broadcast of information
  - minimises monitoring time
  - minimises UE power consumption
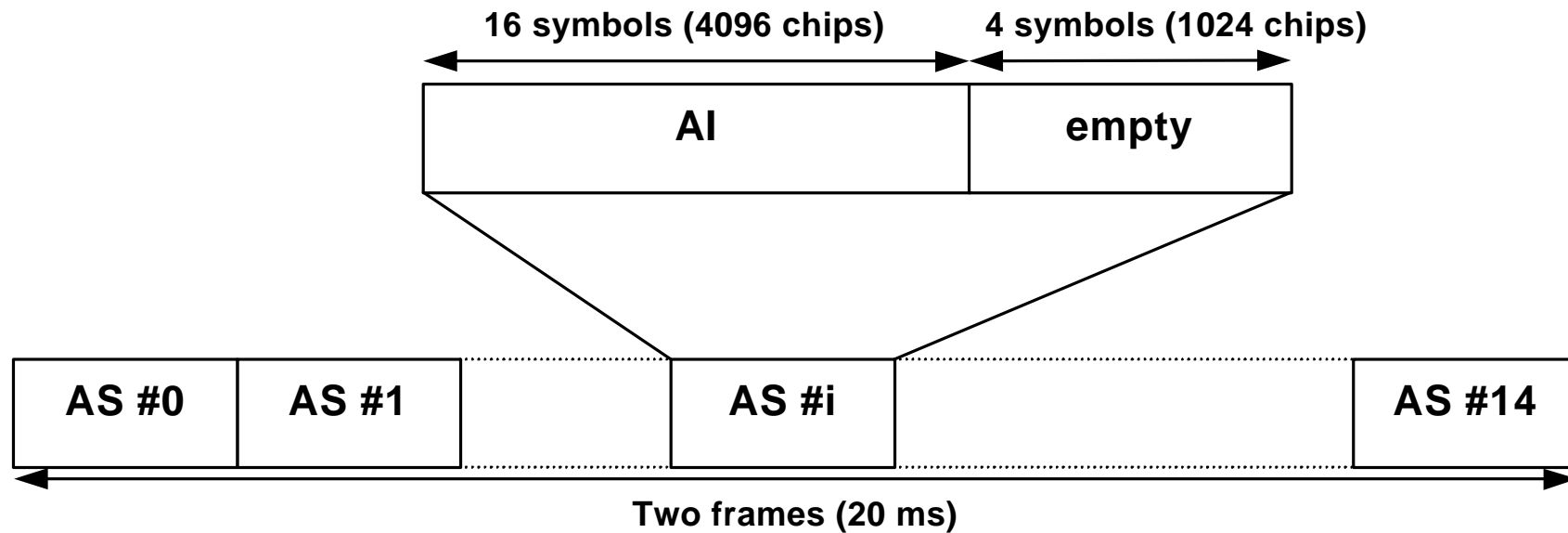 - improves accuracy of information at UE

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Possible Solutions for Status Broadcast

- Use BCH (slow, significant downlink capacity)
- Use AP-AICH signatures (high average power, possible coexistence problems with existing messages)
- Define a new physical channel (needs code resource)
- Use PICH (reduces paging capacity)

Recommended solution

- Use gaps in AP-AICH (minor modification to AICH definition, or as a new physical channel)
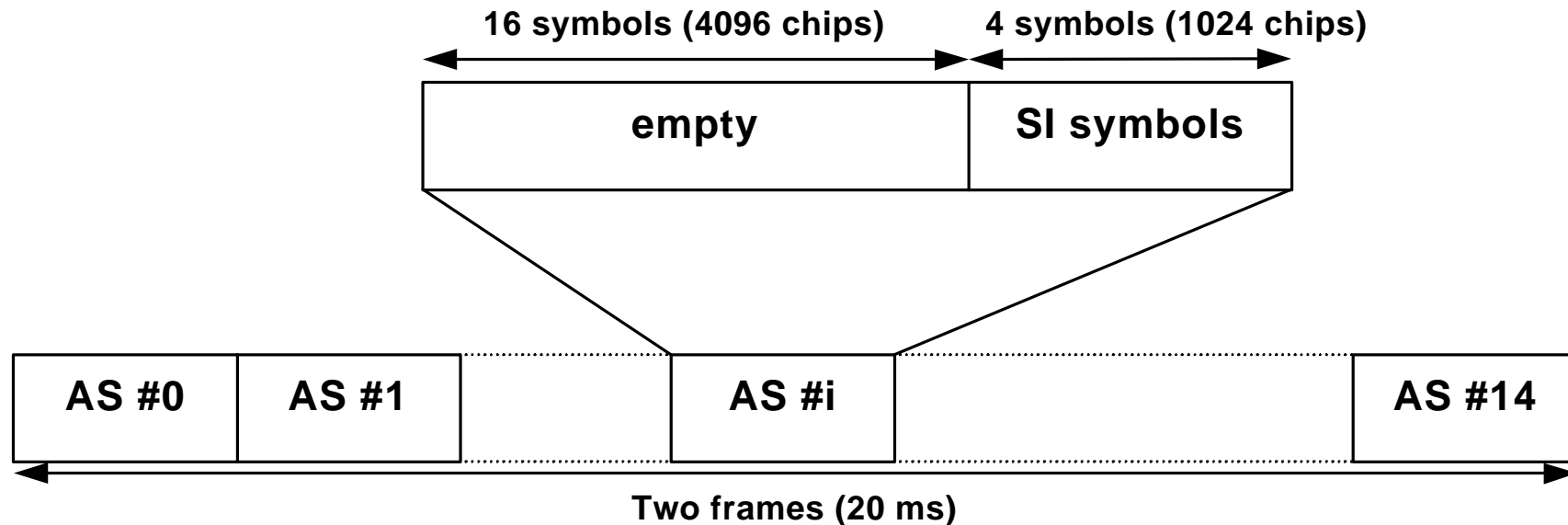
Current AICH structure

AS: Access slot

Proposed CPCH Status Indicator Channel

16 symbols (4096 chips) — empty

4 symbols (1024 chips) — SI symbols

AS #0 | AS #1 | AS #i | AS #14

Two frames (20 ms)

AS: Access slot

The channelisation code is the same as the AICH used for CPCH Access (i.e. the AP-AICH)

60 symbols (120 bits) sent every 20ms

CPCH Status Indication

- Send CPCH Status Indicators (i.e. Flag showing if CPCH is free/not available)

- Modulation the same as for PICH

- 20ms frame, containing 120 bits

- Flag for each CPCH

<div align="center">OR</div>

- Flag for each bit rate (if CA scheme is used)

Mapping Rule for Status Information

Parameters controlled by higher layers:
- Number of status indicators sent per frame (60, 30 ,15, 5, 3, or 1)
- Number of CPCH's (1 to 16)

Bit repetition factor = 15 x 8 / Number of status indicators

- Allowed repetition factors are 2, 4, 8, 24, 40 or 120
- Transmitted symbols are $\pm$ (1+j) due to bit repetition
- Constraint: number of CPCH's should be less than or equal to the number of status indicators
- The CPCH's are mapped to the status indicators thus:

$$\text{Status indicator SI}_i \text{ is associated with}$$
$$\text{CPCH \# (i mod N}_{\text{CPCH}})$$

Similarities between GBT and Philips schemes

- "Non-real-time" status

- Based on existing physical channels

- Simple modulation/demodulation

- Can be used with channel assignment

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Differences between GBT and Philips schemes

	GBT	Philips
Additional channelization code?	Yes	No
Known positions of status indicators?	No	Yes
Expiry time of "free" status?	Indeterminate	Deterministic
Eb/No performance (c.f. PICH)?	Worse	Same
Update rate?	Depends on CPCH availability	Chosen by UTRAN
Peak Power?	Like AICH	Like PICH

Modifications to access procedure

(1) The UE checks the status of the selected CPCH before making an access attempt: If "not available" the access attempt is aborted.

(2) The UE checks thestatus of the selected CPCH if no response is received to an Access Preamble: If "not available" the access attempt is aborted.

Note: The selected CPCH is indicated to Layer 1 by the MAC

Conclusions

CR's 25.211-013 and 25.214-022
(contained in R1-99j18)

- CSICH is a new Physical Channel for transmission of Status Indicators in unused parts of AICH
- SI's are Layer 1information (so no new transport channel is needed)
- UE reads status before making an access attempt, and checks status during power ramping