TSG-RAN Working Group1 meeting #2
Yokohama 22-25, February 1999

TSGR1#2(99)098

Agenda Item: **8.1**

Source: **Ad Hoc #2**

Title: **Report from Ad Hoc #2 SCH multiplexing**

Document for:

Introduction
In the previous WG1 meeting, it was decided that Ad Hoc 2 is responsible for SCH multiplexing issue. Regarding this issue, this document describes differences between ARIB and ETSI, and discussion results in this Ad Hoc, as a summary of this Ad Hoc. Annex of this document shows text proposals reflected these results.

Main difference between ARIB and ETSI
(1) Terminology
Terminology related to SCH multiplexing is different. However, we can see following one-to-one correspondence.

ETSI	ARIB
Primary CCPCH	Perch channel
Primary SCH	First search code
Secondary SCH	Second search code

(2) Transmission scheme of Primary CCPCH and Perch channel
ETSI: Continuous, ARIB: Discontinuous (see Fig. 1)

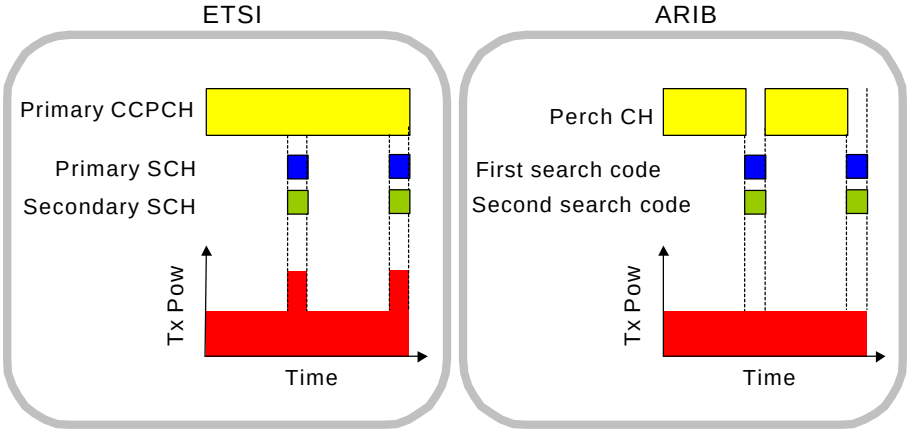


Fig. 1 Difference in transmission scheme

(3) Tx power
ARIB: It is specified that Tx power of the search code symbol can be set independent of that of other symbols on Perch channel.
ETSI: There is no description related to Tx power of SCH.

Discussion Results
(1) Terminology
We do not discuss this issue very much. We should better to wait for TSG RAN decision.

(2) Transmission scheme of Primary CCPCH and Perch channel

Mr. Jamal of Ericsson proposed that 3GPP should adopt ARIB scheme considering PA implementation. He explained ARIB scheme can lower the peak-to-mean power ratio rather than ETSI scheme (see Fig. 1). There were some support opinions and there is no objection, so far. Therefore, it seems Ad Hoc 2 has reached consensus that 3GPP should adopt ARIB scheme for SCH multiplexing issue.

(3) Tx Power
The main responsible of this Ad Hoc mentioned that the capability of the independent power setting for SCH is necessary considering system flexibility. There is a support opinion and there is no objection, so far. Therefore, it seems Ad Hoc 2 reached consensus that 3GPP should adopt capability of the independent power setting for SCH.

Text Proposal
Annex shows text proposals reflected above discussion results. These text proposals are based on the latest S document. In the text proposal, ETSI terminology is mainly used.

Annex

S1.11

5.3.2.1 Primary Common Control Physical Channel (CCPCH)

~~<Editors note: This section has not been updated yet. see Adhoc #2. ETSI: Primary CCPCH is continous. ARIB: Primary CCPCH is discontinous in order to carry time multiplexed SCH.>~~

The Primary CCPCH is a fixed rate (32 kbps, SF=256) downlink physical channels used to carry the BCH.

Figure 1 shows the frame structure of the Primary CCPCH. The frame structure differs from the downlink DPCH in that no TPC commands or TFCI is transmitted. The only Layer 1 control information is the common pilot bits needed for coherent detection. Primary CCPCH is not transmitted during 256 chips in head of each slot. Instead, Primary SCH and Secondary SCH is transmitted during this period (see 5.3.2.2).

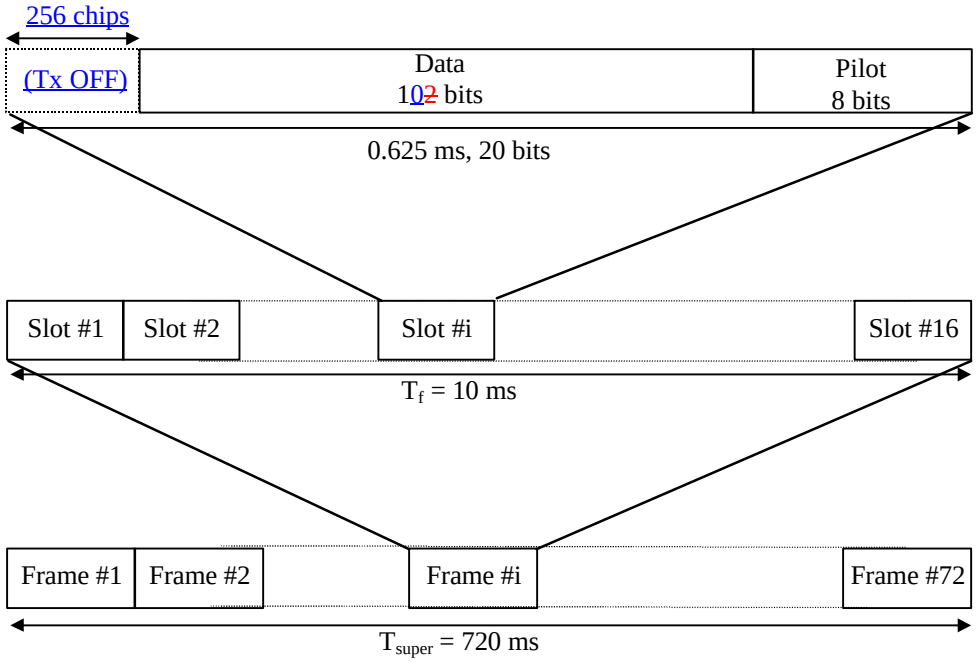


Figure 1: Frame structure for Primary Common Control Physical Channel.

5.3.2.1.1 Primary CCPCH structure with FB mode transmit diversity

<Editors note: This section has not been updated yet. see Adhoc #6>

If diversity transmission is applied on dedicated forward link channels, the Primary CCPCH pilot is transmitted in parallel from both of the antennas as shown in the Figure 2. Different pilot patterns are applied to the different antennas, indicated in Figure 2 by the difference in shading.

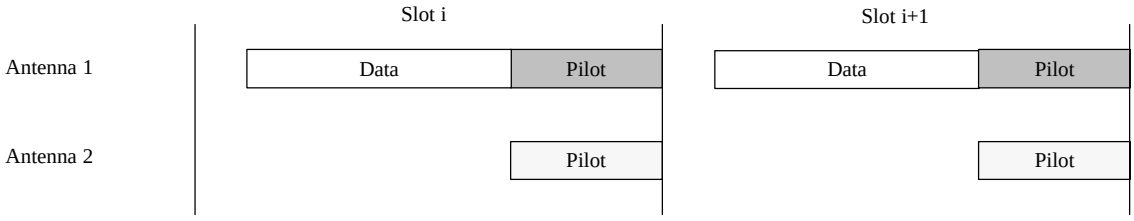


Figure 2: Slot structure of Primary CCPCH when diversity transmission is applied on dedicated channels.

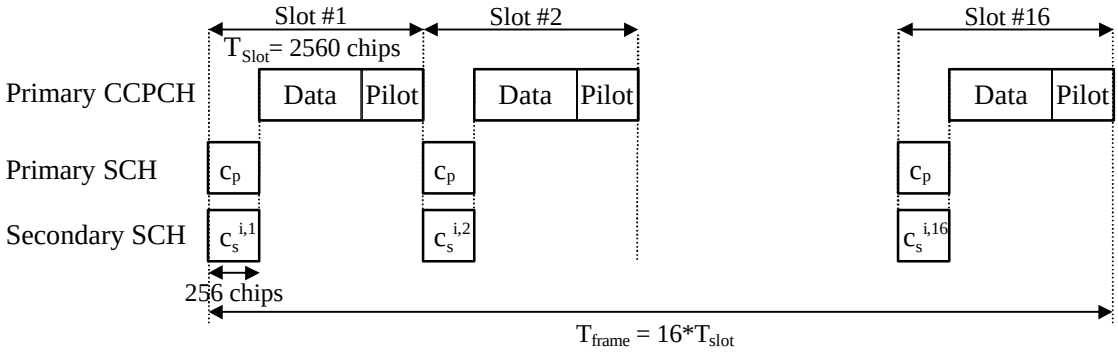
Pilot patterns of the antennas are different and (TBD). The transmission powers of the pilot signals on both of the antennas are the same.

5.3.2.3 Synchronisation Channel

~~<Editors note: This section has not been updated yet. see Adhoc #2>~~

Annex

The Synchronisation Channel (SCH) is a downlink signal used for cell search. The SCH consists of two sub channels, the Primary and Secondary SCH. Figure 3 illustrates the structure of the SCH and transmission timing relation with Primary CCPCH:



c_p : Primary Synchronization Code
$c_s^{i,k}$: One of 17 possible Secondary Synchronization Codes
($c_s^{i,1}$, $c_s^{i,2}$, ..., $c_s^{i,16}$) encode cell specific long scrambling code group i

Figure 3: Structure of Synchronisation Channel (SCH).

The Primary SCH consists of an *unmodulated* code of length 256 chips, the Primary Synchronisation Code, transmitted once every slot. The Primary Synchronisation Code is the same for every cell in the system and is transmitted time-aligned with the period where the Primary CCPCH is not transmitted ~~BCH slot boundary~~ as illustrated in Figure 3.
The Secondary SCH consists of repeatedly transmitting a length 16 sequence of *unmodulated* codes of length 256 chips, the Secondary Synchronisation Codes, transmitted in parallel with the Primary Synchronisation channel. Each Secondary Synchronisation code is chosen from a set of 17 different codes of length 256. This sequence on the Secondary SCH indicates which of the 32 different code the cell's downlink scrambling code belongs. 32 sequences are used to encode the 32 different code groups each containing 16 scrambling codes.

S1.13

7.1 Spreading

Figure 4 illustrates the spreading and modulation for the downlink DPCH and CCPCHs. Data modulation is QPSK where each pair of two bits are serial-to-parallel converted and mapped to the I and Q branch respectively. The I and Q branch are then spread to the chip rate with the same channelization code c_{ch} (real spreading) and subsequently scrambled by the same cell specific scrambling code C_{scramb} (complex scrambling).

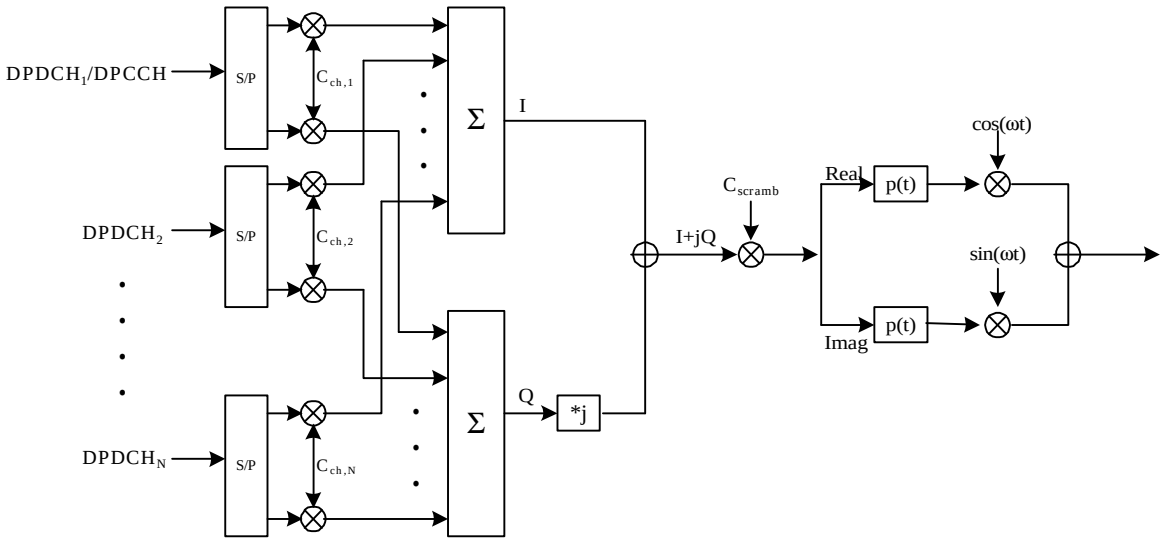
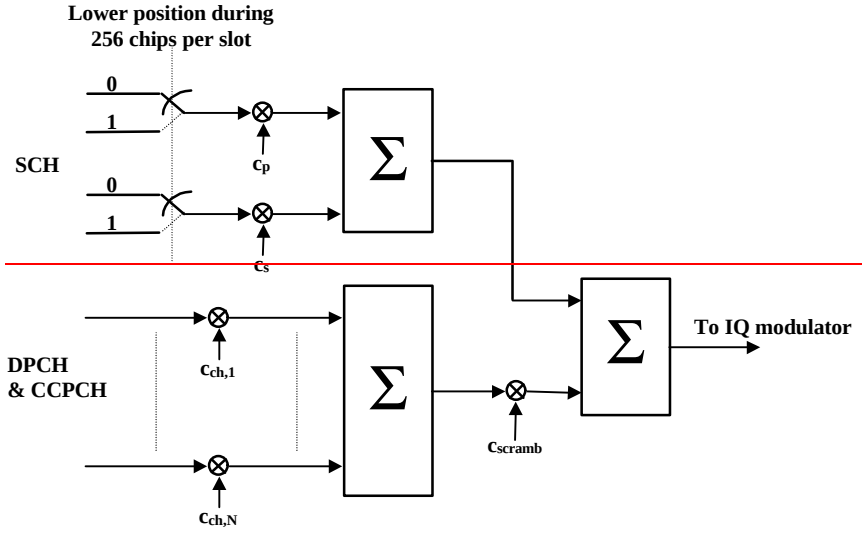


Figure 4. Spreading/modulation for downlink DPCH and CCPCHs.

The different physical channels use different channelization codes, while the scrambling code is the same for all physical channels in one cell.

The multiplexing of the [SCH]{1st and 2nd search codes} with the ~~other downlink physical channels~~[Primary CCPCH] {Perch channel} ~~({DPCH and }CCPCH)~~ is illustrated in Figure 5. The figure illustrates that the [SCH]{1st and 2nd search code} and Primary CCPCH are~~is only~~ transmitted alternately~~intermittently~~. [Primary SCH and Secondary SCH] {The first search code and the second search code} are code multiplexed and transmitted simultaneously during 256 chips per slot. The transmission power of [SCH] {search code symbol} can be adjusted by a gain factor $G_{P\text{-}SCH}$ and $G_{S\text{-}SCH}$, respectively, independent of transmission power of P-CCPCH. ~~(one codeword per slot) and also that the [SCH]{1st and 2nd search code} is {time }multiplexed *after* long code scrambling of the {DPCH and} CCPCH. Consequently, t~~The [SCH] {search code} is *non-orthogonal* to the other downlink physical channels.

[Editor's note: Take texts in [ ] if ETSI's SCH is chosen. Take texts in { } if ARIB's perch channel scheme is chosen.]



Annex

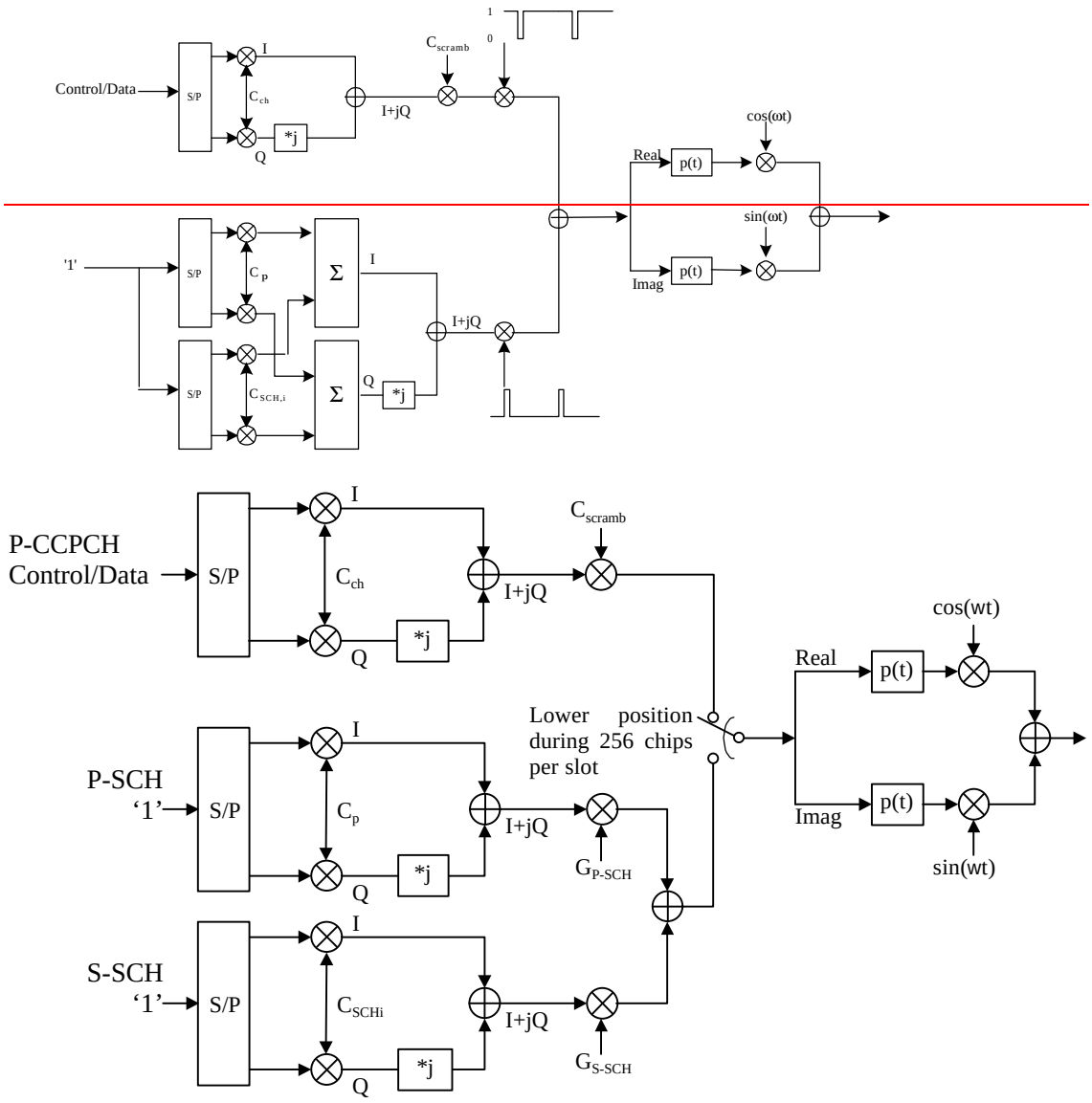


Figure 5. [Multiplexing of SCH]{Transmission of Perch Channel}

~~*<Editor's note: Take the 1st figure if ETSI's SCH is chosen. Take the 2nd figure if ARIB's perch channel is chosen.>*~~

~~<Editor's note: The above two figures should be drawn in a more consistent way, maybe as one figure only. >~~