

Agenda Item: 13
Source: Hyundai Electronics & Shinsegi Telecomm.
Title: New scheme for downlink compressed mode
using common channel
Document for: Discussion

1. Introduction

This document describes a new scheme for downlink(DL) compressed mode(CM) using a common channel, called as “Compressed Mode Common Channel(CMCCH)”.

As stated in TS 25.212[2], to support interfrequency measurements downlink transmission may, on network command, enter CM. An UE which needs interfrequency handover, changes its mode from normal mode to CM. In CM, it acquires the measurement information from the target BS(tBS) using transmission gap from the current BS(cBS). By the way, transmission gap results in several new issues to be solved. One of them is how to transmit the compressed frame, where a compressed frame is defined as the frame including transmission gap[2]. Regarding this issue, there have been several proposals such as changing the code rate, reducing of the spreading factor, and so on [1][2]. However, it is generally known that they are struggling from several problems, such as code shortage problem, no guarantee of orthogonal property and so on, which were already pointed out in [1].

We propose a new scheme to effectively transmit the compressed channel. It is characterized by *the usage of CMCCH while maintaining the spreading factor of existing dedicated channel to be same*. The detailed description is given in section 2.

2. Proposed Scheme

2.1 Operation in CM

The operations of UE and UTRAN in CM are presented in Figure 1. As shown in Figure 1, UTRAN commands that the UE enters in CM. In case of CM decision, UTRAN communicates to the UE the parameters of the CM. In this process, UTRAN informs the UE of the access time to CMCCH which is determined by collision-avoidance function in cBS. After entering CM, UE receives the frame data from cBS continuously except for the compressed frame. The receiving duration of the compressed frame is divided into two parts, as shown in Figure2; active period and idle period, where idle period means to the transmission gap. According to the position of idle period, active period may be either before the idle period or after that. It is sure that active period can be separated into two discrete parts by idle period, but we did not consider that case because it makes this document be complicated and it's not our main concern.

In idle period, UE stops receiving data from cBS so as to receive the measurement data from tBS. And in active period, UE receives the data from cBS through not only CMCCH but also

existing dedicated channel. When UE determines to handover to tBS or not to do, UE exits CM. Otherwise, UE stays in CM.

2.2 Compressed Mode Common Channel (CMCCH)

The main contribution of our proposal is to use a CMCCH. Figure 3 shows the CMCCH structure shared by several UEs, where

- the number that CMCCH can be shared is determined depending on the period of compressed frame and the position of idle period in the frame.
- the slot size of CMCCH is same as the length of active period.
- the minimum unit that UEs can access to CMCCH is same as the basic offset
- T_{offset} is multiple of basic offset.
- the OVFSF code for CMCCH is assigned at the start time of cBS and it should be maintained to be orthogonal with the dedicated channels assigned to UEs in the BS.

3. Example

Depending on the offsets which UEs in CM have, the utilization of CMCCH varies. Figure 4 and 5 show the extreme two cases, best case and worst, respectively. In these figures, we assume the followings,

- the period of compressed frame is 7 frame-length.
- the length of idle period is fixed as a half of a frame-length, that is 5 ms.
- the position of idle period can be either in front or in rear of the frame, which is determined by collision-avoidance function in BS.

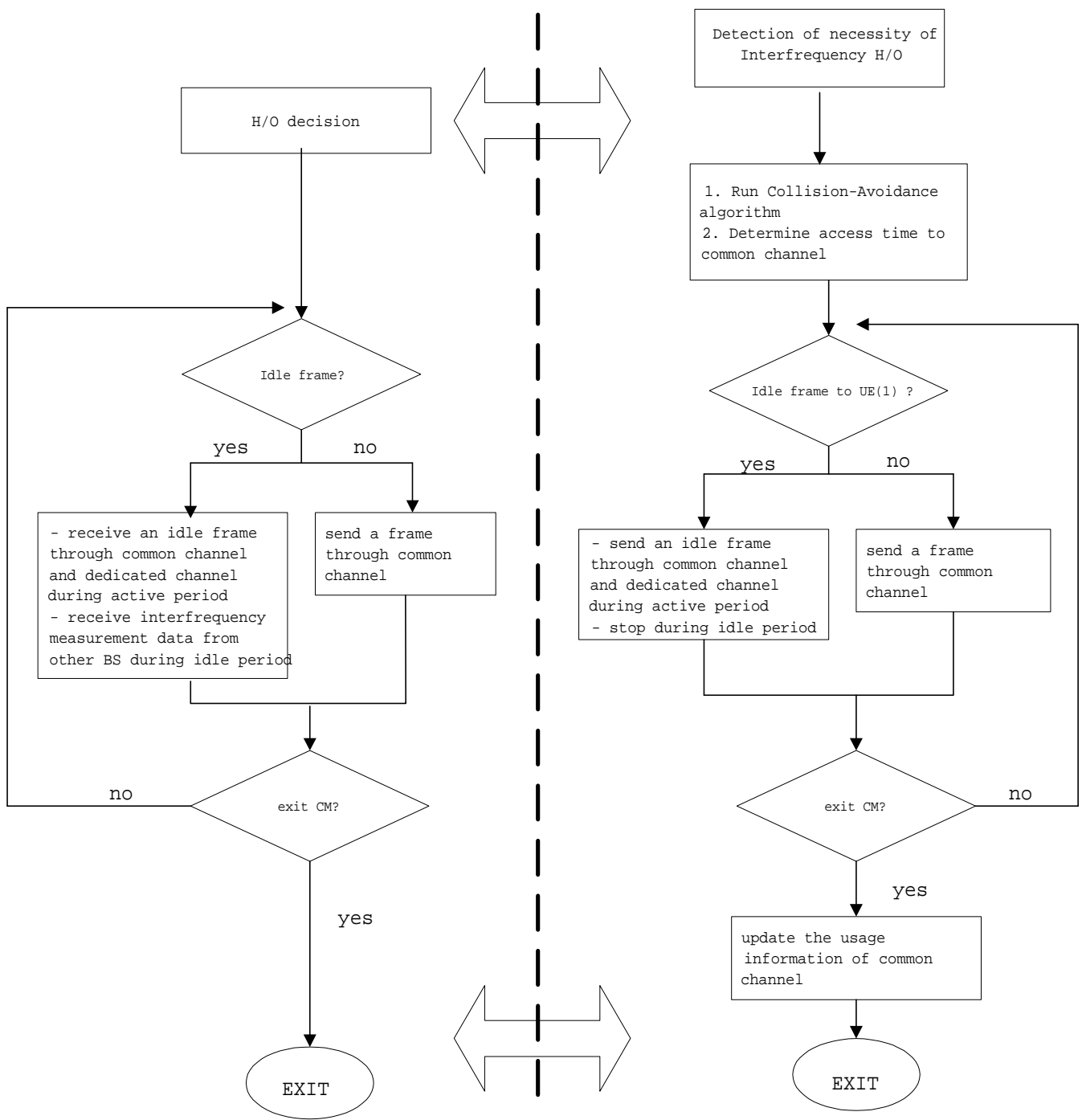
With these assumptions, the utilization varies from 50% to 92.85%. In best case, as shown in figure 4, 13 UEs can share CMCCH, that is, its utilization is $13/14 = 92.85\%$. On the other hand, in the worst case as shown in figure 5, 7 UEs can share CMCCH, that is, its utilization is $7/14 = 50\%$.

4. Conclusions

In this contribution, a new scheme for DL CM using CMCCH is proposed. The proposed scheme has the advantages over the existing proposals.

- Easy maintenance of OVFSF code
- Reduced code shortage problem
- Higher guarantees of orthogonal property
- Wider room to upgrade the performance by adjusting the slot allocation algorithm, the position of idle period.and etc.

Therefore, we strongly recommend that our scheme be used for DL CM.



(a) UE(1)

(b) UTRAN

Figure 1. Operation of UE and UTRAN in CM

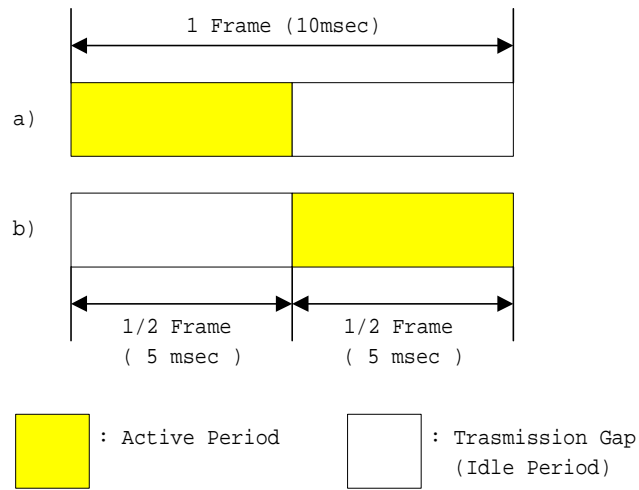


Figure 2. Example of location of idle period and active period.

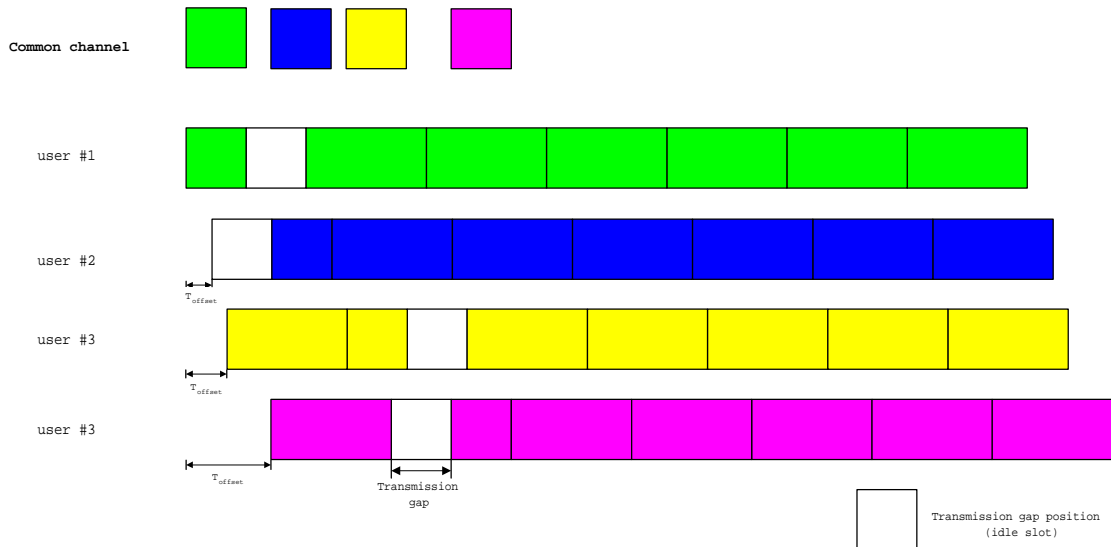


Figure 3. CMCCH shared by several UEs

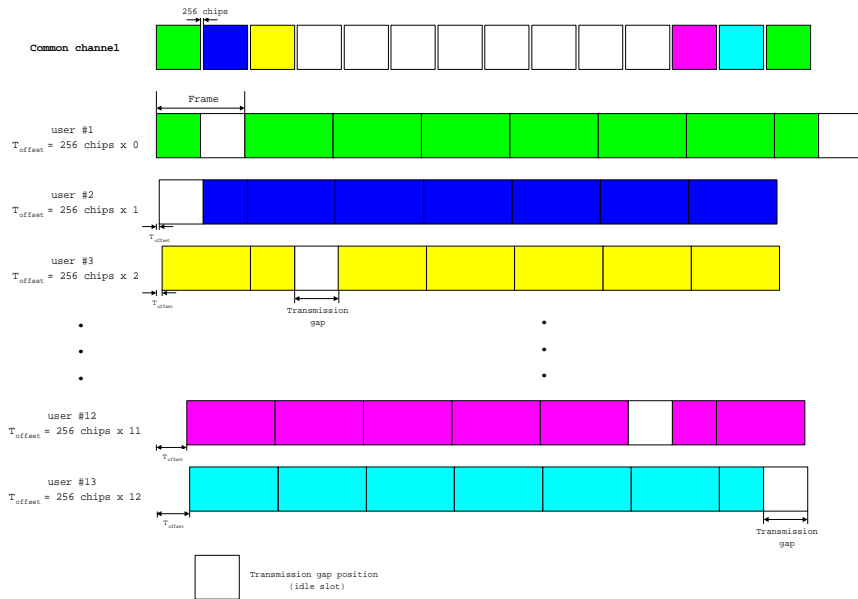


Figure 4. Best case example

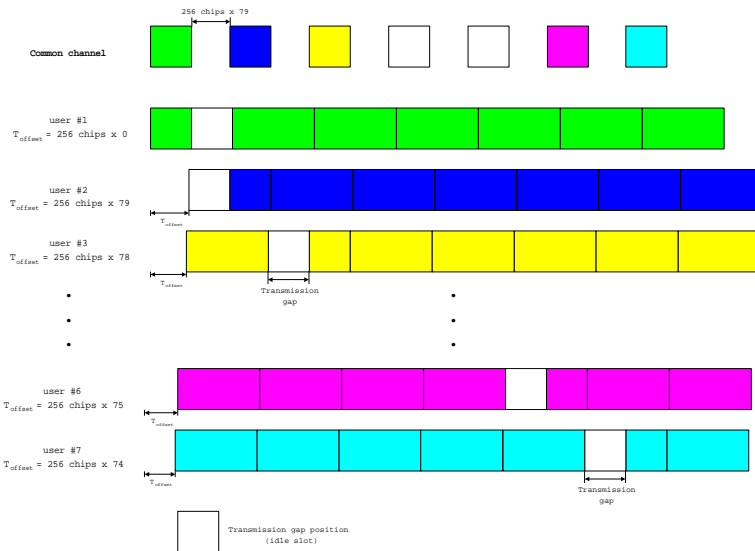


Figure 5. Worst case example

[Reference]

- [1] “Slotted mode in UTRA FDD downlink”, TSGR1#3(99)175, SONY International(Europe) Gmbh, TSG-RAN working Group 1 meeting #3, Eskilstuna, Sweden 22-26, March 1999
- [2] 3GPP RAN TS 25.212 V1.0.0: “Multiplexing and channel coding(FDD)”

Appendix A. List of E-mails about the proposed schem

Date	Sender	Company	Question	Remark
			Response	
June 29, 1999			Our proposal was opened by E-mail	
June 29, 1999	Eric Dahlman	Ericsson	How will you deal with the fact that DL users are not fully synchronized on the DL, i.e. one user may enter CM slightly before another user leaves CM?	
June 30, 1999			<ol style="list-style-type: none"> 1. All users in a base station are synchronized on primary CMCCH of the base station. 2. I'd like to know what you intended to comment in detail 3. Once synchronization is achieved, we need not concern the collision problem among users. 	<p>response</p> <p>question</p> <p>response</p>
June 29, 1999	Evelyne Le Strat	Nortel Networks	<ol style="list-style-type: none"> 1. CMCCH carries data from the compressed mode from several UEs in a time-multiplexed manner? 2. Contrary to the shared channel the synchronisation of that CMCCH has to be aligned to the sync of the dedicated channels? 3. Another question concerned with WG2 	
June 30, 1999			<ol style="list-style-type: none"> 1. to clarify the question. Our proposal is concerned with downlink CM. 2. The CMCCH is aligned to the sync of the dedicated channel in a base station 3. to agree on the point that it may be related with WG2, however, we believe that our proposal is within the scope of WG1 <ul style="list-style-type: none"> - the scope of WG1 is to define the channels and to describe their usage - the main contribution of our proposal is to define the CMCCH and its usage for CM. 	response
June 29, 1999	Jussi Kahtava	Nokia-Japan	How to handle the transmission of TFCI symbol during CM	

June 30, 1999	Eric Dahlman	Ericsson	DPCH may have a frame/slot timing which is adjusted a multiple of 256 chips compared to the Primary CCPCH because the DPCH timing is adjusted at SOHO due to the lack of synchronization between the cells and a base station avoids “peaks” in the BS processing requirements.	explain / response
July 1, 1999			Our conclusion about synchroniztion is as follows: 1) A transmission gap position can be either in the front or in the rear of the compressed frame. 2) the OVSF code for CMCCH is assigned at the start time of cBS and it should be maintained to be orthogonal with the dedicated channels assigned to UEs in the BS. 3) Even though we consider the offset, the utilization of CMCCH is always guaranteed as higher than 50%. 4) With utilization of 50% and the attractive merits of our scheme as described in our first mail, we strongly recommend to use CMCCH for DL CM.	response
July 1, 1999	Bruno Schuffenecker	France Telecom/ Cnet	1. What happen if there users enter in compressed mode later in this cell with your CMCCH scheme? 2. Does your scheme suppose that current cell chooses all of the Toffset of the DPDCHs in compressed mode?	
July 1, 1999			Although any Toffsets are not assigned in the current base station, our scheme can be used regardless of the base stations to assign the UE’s offsets.	response
July 6, 1999	Peter Chambers	ROKE, UK	In order to use the power of the technique considerable co-ordination of UTRAN elements seems needed.	
July 7, 1999			The proposed scheme needs only the information related with current cell, not any additional information related with other cells.	response

Appendix B. List of text related with the proposed scheme

Spec	Section	Remark
25.212	4.4.2.4	to add “4.4.2.4 Method C : by Using Compressed mode Common Channel(CMCCH)”
	4.4.3.3	“Parameters for Compressed Mode”
25.302	7.3	“Slotted Mode”
	8	“Primitives of the physical layer”
25.303	7.4.7	“Hard Handover (FDD and TDD hard)”
25.331	8.3.5.2	“Hard handover (FDD and TDD hard”
	8.3.5.3	“Inter system hard hand-over (GSM/BSS to UTRAN)”
	8.3.5.4	“Inter system hard hand-off (UTRAN to GSM/BSS, PSTN/ISDN domain services)”