TSG-RAN WG#1 Meeting#7 TSGR1#7 (99)d09

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Agenda Item: Ad Hoc - 3

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# Support of Multi-Frame Page Messages

## Introduction

In a 3GPP-WCDMA system the Secondary CCPCH is used to carry the FACH and PCH. The Secondary CCPCH can support variable rate with the help of TFCI field. Although, the Secondary CCPCH channel bit rate can vary from 32 kbps to 2048 kbps, it is highly unlikely that channel bit rates more than 128 kbps will be supported. This is due to the fact that the power requirement for overhead channels should be minimized to maximize the number of users in a WCDMA system.

Currently, the structure of PICH allows, the page messages to be transmitted in one 10 msec frame following the PICH frame. However, for higher payload sizes, extending the paging message over multiple frames will lead to higher trunking efficiency. As an example, let us assume 100 bits fit in a 10 msec frame and there are enough pages queued for a first frame to consume 120 message bits and enough pages queued for a second frame to consume 80 message bits. In this case, at least one of the pages from the first frame would need to be delayed to a subsequent paging occasion because there is not sufficient room in the frame. By combining the pages from the first and second frames, this problem could be avoided due to higher trunking efficiency. It should also be noted that there is a tradeoff between trunking and sleep mode efficiency, since UE may have to stay awake for multiple frames. But, this can be mitigated by using a mechanism to determine which frame the UE is allowed to sleep after. Finally, this method could be used to allow a larger DRX cycle (increase sleep mode efficiency) without sacrificing delay because of the larger message throughput.

In this contribution, a simple modification is proposed for support of multi-frame page messages.

## 1.0 Current Structure of PICH and Message part

The Page Indication Channel (PICH) is a physical channel used to carry Page Indicators (PI). Figure 1 illustrates the frame structure of the PICH. One PICH frame is of length 10 msecs and consists 300 bits (150 symbols). Of these, 288 bits are used to carry Page indicators and the rest 12 bits are not used. The Page Indicators indicates to a UE that there may be a page intended for it. The UE monitors its PI and if it is determined to be in 'on' state, the UE reads PCH after a predefined time $T_{PICH}$ as shown in Figure 1. With this structure, it is not possible to support multi-frame messages on the PCH since there will be a conflict of the message part in the second frame corresponding to Page Indicators of the second frame.

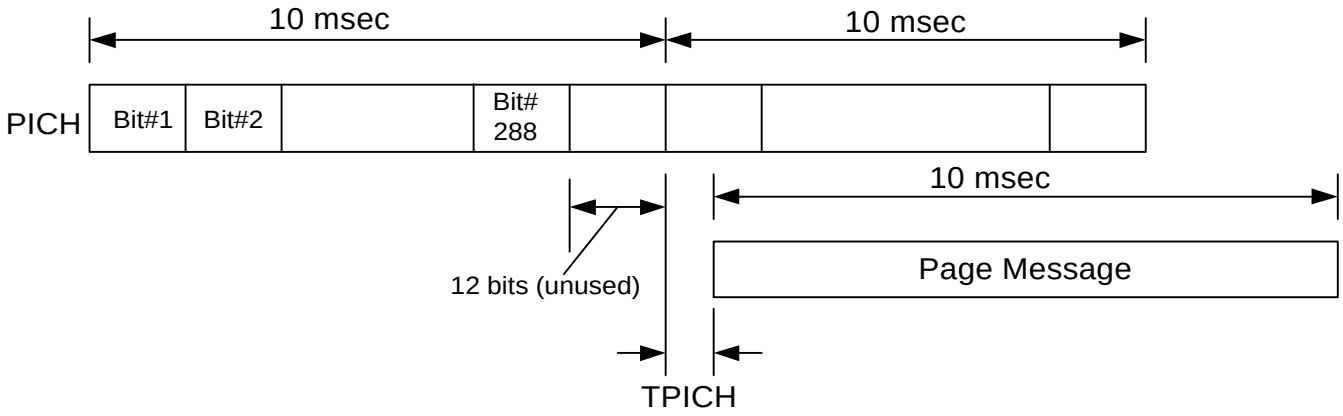


Figure 1

## 2.0 Proposed Structure of PICH and Message Part

It is proposed to increase the size of PICH frame from one (1) frame to $N_{max}$ frames where $N_{max}$ is in the range of 1 to 8 followed by a Paging channel Message of length up to $N_{max}$ frames. Figure 2 shows an example where $N_{max} = 4$. UEs are expected to have a DRX cycle (measured in frames) which specifies how often to wake up to receive Paging Indicators. The DRX cycle would be variable to allow trade off between delay and sleep mode efficiency. In case $N_{max}$ is set to 8 frames, the minimum value of DRX cycle should be greater than or equal to $N_{max} = 8$. The parameters $N_{max}$ and bit rate of the paging channel are broadcast on the BCH.

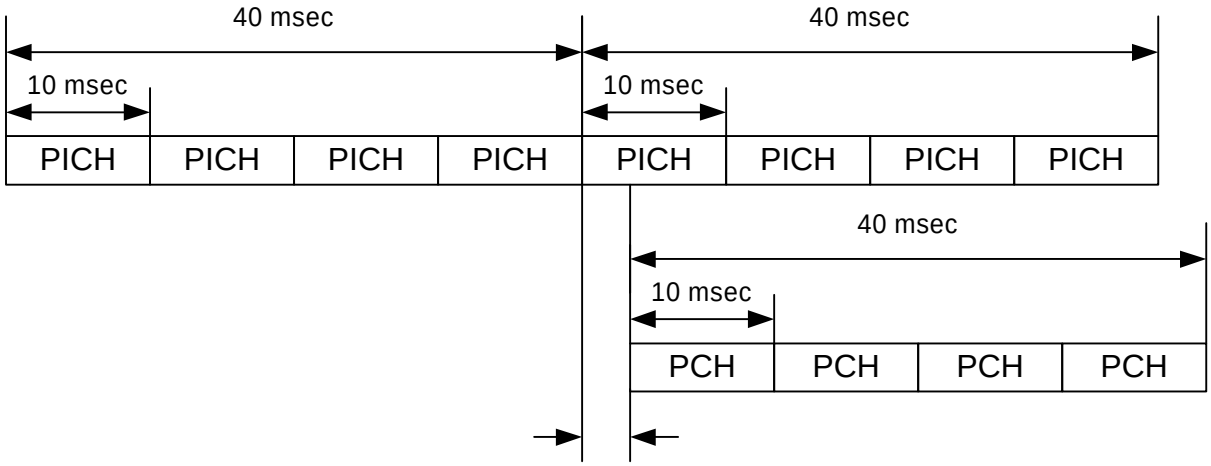


Figure 2

## 3.0 Conclusion

The modified structure allows one to support multi-frame messaging on paging channel thus improving the trunking efficiency.

## 4.0 References


[1] Ericsson, “Proposal for a modified PCH structure”, TSGR1#5(99)604.
[2] Ericsson, “Description of DRX”, TSGR2#5(99)590.
[3] Ericsson, “Updated text proposal for Paging Structure”, TSGR1#6(99)848.
[4] TS 25.304, “UE Procedures in Idle Mode”, v1.3.2