Title:	**Measurement channels for compressed mode**
Source:	**Vodafone**
Agenda item:	**8.2**
Purpose:	**Discussion and decision**

Introduction

Handover from UTRA to GSM is viewed as an essential feature for dual mode GSM/UMTS operators. This is particularly true for the initial days of UMTS. In order to perform handovers from UTRA FDD to GSM carrier, the terminal will need to synchronise to the GSM BCCH carriers and provide measurements to the network.

The best solution is to have a second receiver in the UE, however, there are some considerations provided by terminal manufacturers which indicate that this may not be feasible. Although the specifications do not exclude dual receiver operation they contain an alternative which is compressed mode.

Until now there has been no discussion on or assessment of the impact of compressed mode on the performance of the a UTRA FDD link. This document provides a generalised compressed mode pattern for the purpose of generating a measurement channel to assess the performance for the UTRA FDD downlink.

Requirements

The requirements for compressed mode can be summarised by the following two items:

- Attaining a reasonable indication of the quality of the carriers that are available.
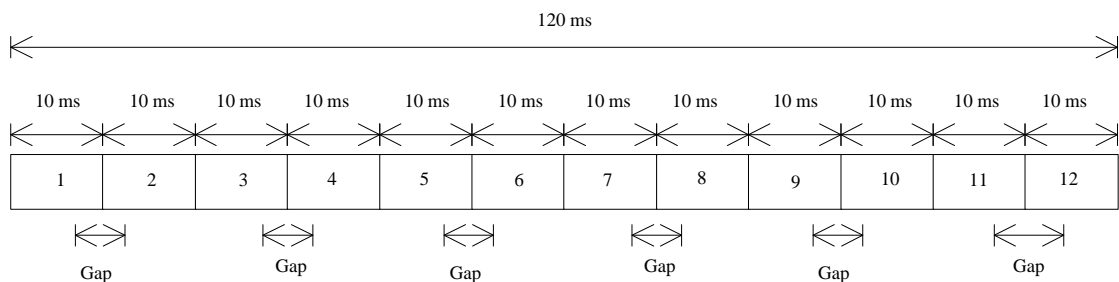- Performing so with minimal degradation to the link or the overall capacity of the system.

Aspects of compressed mode patterns

The performance of the compressed mode needs to be as close to the GSM performance as possible. To summarise this, in GSM the traffic channel repeats in a 120 ms, 26-frame multi-frame. The first 25 are used by the MS (GSM UE) to transmit and receive and perform measurements on serving and neighbour cells (i.e. 25 samples). The MS has a window of approximately 4 slots to perform the measurements (2.3 ms). The last frame is idle and used for search purpose, which presents the MS with an 11 GSM slot period to do so (6.4 ms). This pattern is repeated and the measurements and synchronisation are performed continuously.

Proposal

Based on the fact that the default speech codec of UMTS uses 20 ms speech frames, it can be easily seen that it the radio frame to transport this should be at least 20 ms long. Therefore, it can be assumed that this will be interleaved over 20 ms or two radio frames. To obtain the maximum gain out of interleaving, it is best to place the gaps of the compressed mode in the middle of the two frames. This serves another purpose in that it limits the number of slots taken per frame.

Therefore, we would like to propose a pattern that combines the search procedure with measurements.

120 ms

10 ms   10 ms   10 ms   10 ms   10 ms   10 ms   10 ms   10 ms   10 ms   10 ms   10 ms   10 ms

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

Gap   Gap   Gap   Gap   Gap   Gap

Per 12 radio frames, the first 10 will contain a double frame gap, which can last to whatever is appropriate for GSM measurements. The last two frames will contain a double frame that is long enough to perform a search (again suitable for GSM).

There have been some input suggesting that a UE can perform 2 GSM measurements (on different carriers) in a 3-slot gap. In this case the proposed pattern will give 10 measurements per 120 ms (compared with 25 in GSM). We need to establish the capability of the UE to perform more measurements in slightly bigger gaps (i.e. 4 measurements in 4-slot gap or 6-slot gap). This would give 20 measurements per 120 ms, which is close to the GSM performance.

Way forward in this meeting

A discussion is needed in order to accommodate these requirements within the scope of compressed mode as described in WG1 specifications. Specifically, we need to discuss how the compression is achieved for the various configurations of the gaps.

Furthermore, we need to establish what the UE is capable of performing, so as to maximise the number of samples that can be taken with the minimum of slots.

Conclusion

- Terminal manufacturers should provide information about the capability of performing measurements for both GSM and UMTS in a specified gap length

- Measurement channels based upon the above description should be developed and test conditions set with view of providing input in the next meeting. These should use this pattern and test for gaps of 3, 4 and 6 slots.

- Variations on this scheme to improve performance are welcome, however, the basic concept (of interleaving measurements and synchronisation tasks should be adhered to. Also the number of samples should be sufficiently large (>100/sec).