3GPP TSG RAN WG1 Meeting #7 *TSGR1#7(99)b98*
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Source: **Mitsubishi Electric**

Title: **Compressed Mode for FDD-FDD Handover preparation**

Agenda item: **11**

Document for: **Discussion and decision**

1. Introduction

In this document, we propose compressed mode patterns for IFHO preparation from UTRA-FDD to UTRA-FDD. Because there is no simulation results here, we consider the patterns required for this IFHO preparation, considering various situations for UE. We believe it is very important to set some patterns as WA even if it includes a little too many patterns.

2. Discussion

2.1 Assumption

Before discuss compressed mode patterns for UTRA FDD to UTRA FDD IFHO preparation, we summarize our assumptions.

- The frequency switching time required for UE is assumed to be 666us (equal to the slot duration) which includes implementation margin. This assumption means UE will consume 1slot of TGL for frequency switching (go and return) time.

- When UE enters compressed mode, synchronization to current BTS has already been stable. This is a little different situation from normal cell search condition.

- Using compressed mode, UE will have two kind of mode. **Selection mode:** UE will try to make cell search using stage 1, 2, 3 [1], **Reselection mode:** If UE detects target scrambling code, then it begins monitoring the power of this code using stage 3. Also, the UE surroundings decide the required compressed mode pattern. For example, when the UE stays micro / pico cell covered by macro cell, the pattern for high speed measuring is needed.

- We understand that the performance of cell search stage 2 will improve using frame-wide observation. Because it depends on correlation property of S-SCH code. Even though the UE observes the limited area of S-SCH code, the UE could identify the group code of the target cell, but it will take longer time.

- The parameter that is considered here does not need to introduce newly defined parameters.

2.3 Proposed compressed mode patterns

Concerning the assumption and UE situation totally, we propose the following parameter and patterns (see Table1, 2 and Figure1) with flexibility so that network can make a choice according to their convenience. Table 1 is applied to selection mode, table 2 is applied to reselection mode.

Table 1: Compressed Mode Parameters for selection mode

	TGL	TGD	TGP1	TGP2	PD
Pattern1	7	24/15	4	20	M
Pattern2	7	24/15	4	140	M
Pattern3	7	2	4	Not Used	M
Pattern4	7	2	4	20	M

Pattern5	7	2	4	140	M
Pattern6	14	3	6	18	M
Pattern7	14	3	6	138	M

Table 2: Compressed Mode Parameters for reselection mode

	TGL	TGD	TGP1	TGP2	PD
Pattern8	7	0	72	Not Used	M
Pattern9	7	0	144	Not Used	M

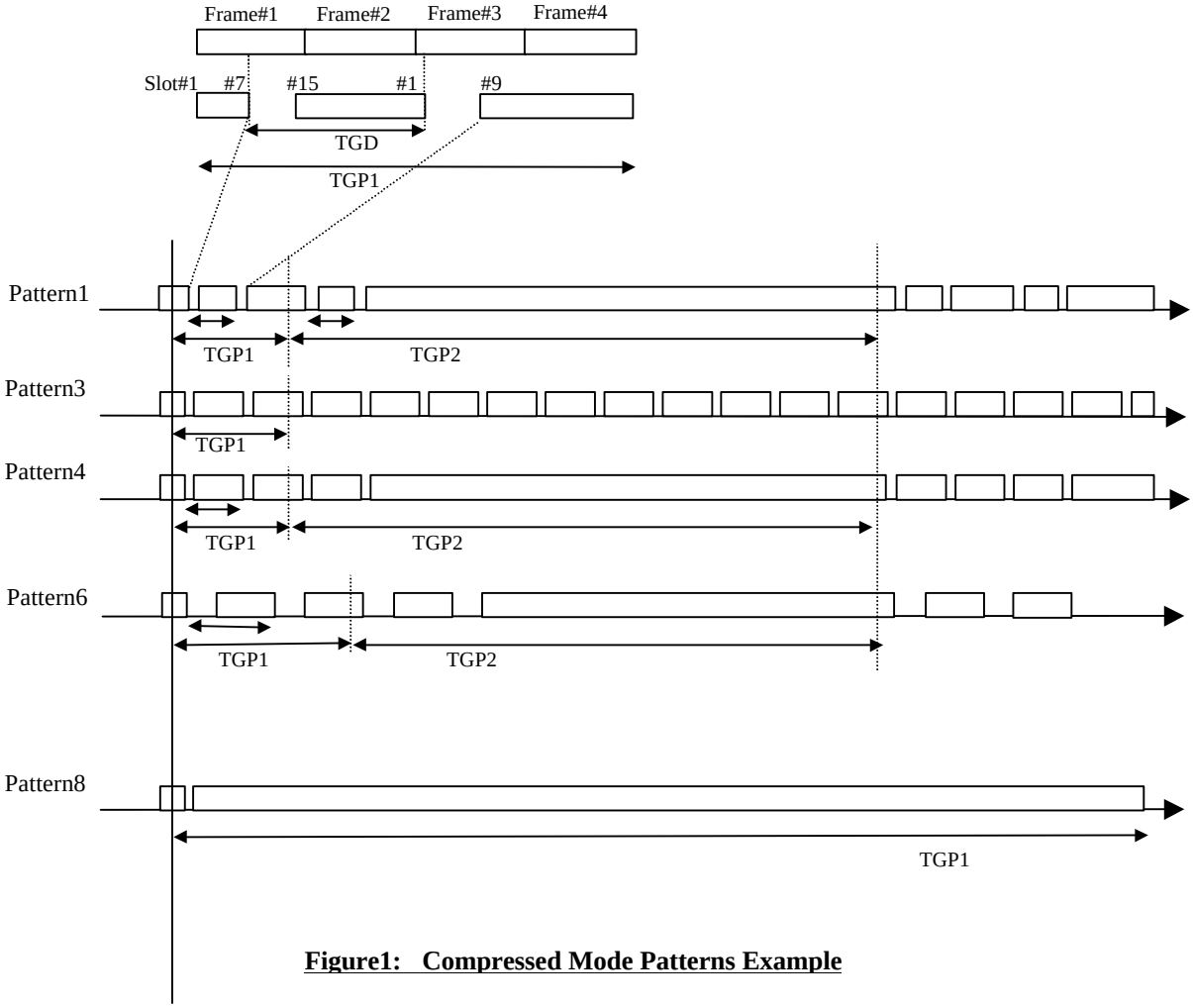

Figure1: Compressed Mode Patterns Example

Pattern 1 to 5 uses 7slot TGL. Pattern 6,7 use 14 slots TGL. Using 14 slot TGL may improve cell search time. On the other hand, using 7slot TGL will cause less interference on the system.

The difference between pattern1,2 pattern 4,5 pattern 6,7 is observation period, characterized by TGP2. Namely, pattern 1,4,6 monitors 4 groups of TGL 3 times per super frame. This is convenient to fast search. On the other hand, pattern 2,5,7 monitors 4 groups of TGL 1time per 2 super frames. This is convenient to slow search.

The difference between pattern (1,2) and (4,5) is; pattern(1,2) can make frame-wide observation which could improve stage 2 performance, on the other hand pattern (4,5) observes the same position of the frame, but it might be easy to make compressed frame because of the same pattern. This difference is characterized by TGD.

Pattern 3 is reserved for very fast search.

Except for pattern3, all patterns have consecutive 4-gap length. So, UE can make a choice to use each TGL. Foe example, (stage1, stage1, stage2, stage3) is used for stable performance of 1st stage, or (stage1, stage2, stage2, stage3) is used for stable performance of 2nd stage.

It might be possible for another way of using these patterns, for example, with pattern 1, first 4 TGL is used for stage1, 2nd 4TGL are used for stage2, and 3rd 4TGL are used for stage3.

Pattern8, 9 is used for the UE during reselection mode. Therefore, it is enough to adopt the transmission gaps length = 7 only.

PD includes undefined parameter M. M should be indicated by network per DCH, so it doesn't need to be fixed in WG1. When M is set to zero, we propose it should mean, "infinitely repeat until network requests to stop".

Text proposal for 25.231 (Physical Layer – Measurements), Section 7.1.3.3

7.1.3.3.4 Monitoring of FDD cells on other frequencies at the UE for the handover preparation from UTRA FDD to UTRA FDD

Upper layers may ask FDD UE to perform preparation of inter-frequency handover to FDD. In such case, the UTRAN signals to the UE the handover monitoring set, and ~~the~~ if needed, the compressed mode parameters used to make the needed measurements. Setting of the compressed mode parameters defined in section 7.1.3.3.2 for the preparation of handover from UTRA FDD to UTRA FDD is indicated in the following section. The compressed mode for IFHO preparation from UTRA-FDD to UTRA-FDD has two different modes. One is "selection-mode". The UE must identify the cell during this mode. The other is "reselection-mode". The UE measures signal strength by the scrambling code already known. Selection mode / reselection mode parameter sets are described in section 7.1.3.3.4.1 / 7.1.3.3.4.2 respectively.

Measurements to be performed by the physical layer is defined in section 7.1.~~1~~.3.3.4.~~2~~3.

7.1.3.3.4.1 Setting of the compressed mode parameters for selection mode

During the transmission gaps, the UE shall perform measurements so as to be able to report to the UTRAN the frame timing, the scrambling code and the Ec/Io of Primary CCPCH of up to the [x] FDD cells in the handover monitoring set.

<Editor's note : the sentence before is inconsistent with the following section. This inconsistency needs to be solved>

When compressed mode is used for cell acquisition at each target FDD frequency, the parameters of compressed mode pattern are fixed to be :

~~TGL~~	~~TGD~~	~~TGP~~	~~PD~~

	TGL	TGD	TGP1	TGP2	PD
Pattern1	7	24/15	4	20	M
Pattern2	7	24/15	4	140	M
Pattern3	7	2	4	Not Used	M
Pattern4	7	2	4	20	M
Pattern5	7	2	4	140	M
Pattern6	14	3	6	18	M
Pattern7	14	3	6	138	M

<Note1: Frame method and transmission gap position of each pattern will be proposed in R1-99b99>

<Note2: The frequency switching time required for UE is assumed to be 666us (equal to the slot duration) which includes implementation margin. This assumption means UE will consume 1slot of TGL for frequency switching (go and return) time.>

7.1.3.3.4.2 Setting of t he compressed mode parameters for reselection mode

This parameter sets are used for UE which has already known scrambling code. UTRAN indicate which pattern will be used by UE.. According to the result during reselection mode, If needed, UTRAN will indicate the transition back to the selection mode.

	TGL	TGD	TGP1	TGP2	PD
Pattern8	7	0	72	Not Used	M
Pattern9	7	0	144	Not Used	M

7.1.3.3.4.3 Measurements

During the measurement process of FDD cells on a different frequency, the UE shall measure the following information:

- The UE shall measure from the FDD cells on another frequency, belonging to the handover monitoring set, the E_c/I_0 of the Primary CCPCH.
- Relative timing between the scrambling codes of the serving and measured cell as derived from the scrambling codes used on the Primary CCPCH.

References

[1] 3GPP RAN 25.214 V1.1.1

[2] Comparison of the 3GPP and CPM Schemes, TSGR1#3(99)328 Texas Instruments