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Agenda item: Ad hoc 8 (handover)

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Title: Compressed mode for GSM measurements, revised

Document for: Approval

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1. Introduction

This document proposes some changes, corrections and clarifications to TS 25.231 concerning GSM measurements and synchronization to GSM.

It was presented on WG1 meeting no. 7 as tdoc 99a95 where the addition of a note for further patterns for power measurements was requested.

Some points were already introduced in [1] and are worked out more clearly in this document to ease insertion into TS 25.231.

2. Description

2.1 Chapter 7.1.3.3.6.2, Power measurements

In chapter 7.1.3.3.6.2, we propose some compressed mode parameters for GSM power measurements in order to fill the empty table. It should be noted that these parameters are intended to be used with a known GSM neighbour list signaled by the UTRAN. As the capacity loss by large gaps needed for a full measurement of all GSM frequencies is highly undesireable, this kind of signalling is recommended.

For the synthesizer settling time and implementation margin, our current working assumption of two times 500 µs plus 200 µs is inserted. Note that this includes the additional margin needed with simultaneous UL/DL compressed mode due to the UL/DL frame offset.

2.2 Chapter 7.1.3.3.6.3, SCH decoding without prior timing information

In order to clarify the synchronization process to GSM, we introduce in chapter 7.1.3.3.6.3 a "FCCH-found" signal and the according search procedures. With parallel search, the search in the UE ends in about half of the cases with finding the SCH and in the other half with finding the FCCH. The serial search always looks first for the FCCH. With the additional text proposed, the UTRAN is now able to stop the actual pattern and schedule an appropriate single gap for SCH acquisition, or to simply continue the pattern which might be sometimes more practical depending on the search pattern. Scheduling a single gap for SCH search is the same case as chapter 7.1.3.3.6.4, SCH decoding with prior timing information.

Patterns to fill the table are proposed in [2].

2.3 Chapter 7.1.3.3.6.4, SCH decoding with prior timing information

Chapter 7.1.3.3.6.4 contains some old text describing methods not needed anymore. Using the adjustable transmission gap position described in specification 25.212, chapter 4.4.3.2 and specification 25.231, chapter 7.1.3.3.2, we can receive SCH much faster using one single gap with the right timing. The transmission gap can be scheduled very flexibly and the needed time for decoding SCH with known timing would be in the range of a few frames and is probably mainly limited by the speed of signalling.

2.4 Chapter 7.1.3.3.6.5, BSIC reconfirmation

The last change is for chapter 7.1.3.3.6.5, where some text referring to BSIC decoding with unknown timing is deleted, as this case never exists. Prior to BSIC decoding, the SCH timing is always known and signalled to the UTRAN.

3. Text proposal for changes to TS 25.231

7.1.3.3.6 Measurements for the handover preparation from UTRA FDD to GSM at the UE

7.1.3.3.6.1 Introduction

[…(no changes)…]

7.1.3.3.6.2 Setting of compressed mode parameters for Power measurements

When compressed mode is used for GSM BCCH power measurements, the parameters of compressed mode pattern are fixed to be :

Pattern No.	TGL	TGD	TGP	PD
1	3	0	8	128
2	tbd	tbd	tbd	tbd
3	tbd	tbd	tbd	tbd
4	tbd	tbd	tbd	tbd

Pattern 1 allows measuring all the adjacent cell signal levels even with the maximum of 32 frequencies, if two measurements are done during each transmission gap. The pattern can be repeated by sending the measurement request again, if more measurement data is desired.

< NOTE: Further compressed mode patterns with more and/or longer gaps for making more measurements will be introduced soon. >

In order to fulfil~~l~~ the expected GSM power measurements requirement, the UE can get effective measurements samples during a time window of length Tmeas, equal to the transmission gap length reduced by an implementation margin of [2*500 µs + 200 µs ~~x~~], ~~that~~ which includes the maximum allowed delay for a UE's synthe~~st~~izer to switch from one FDD frequency to one GSM frequency and switch back to FDD frequency, plus some additional implementation margin.

7.1.3.3.6.3 Setting of compressed mode parameters for first SCH decoding without prior knowledge of timing information

The setting of the compressed mode parameters is described in this section when used for first SCH decoding of one cell when there is no knowledge about the relative timing between the current FDD cells and the neighbouring GSM cell.

On upper layers command, UE shall pre-synchronise to the each of GSM cells in the handover monitoring set and decode their BSIC. *< Note : the proper reference to GSM specs should be added here >*

When compressed mode is used to perform initial FCCH/SCH acquisition, the compressed mode pattern belongs to the list of patterns in table .

In order to fulfill the expected GSM SCH speed requirement, the UE can get effective measurements samples during a time window of length Tmeas, equal to the transmission gap length reduced by an implementation margin of [2*500 µs + 200 µs ~~x~~], that includes the maximum allowed delay for a UE's synthe~~st~~izer to switch from one FDD frequency to one GSM frequency and switch back to FDD frequency, plus some additional implementation margin.

	TGL	TGD	TGP	PD
Pattern 1	Tbd	Tbd	Tbd	Tbd
…	…	…	…	…
Pattern 2^N	Tbd	Tbd	Tbd	Tbd

Table .- List of compressed mode patterns used for initial GSM FCCH/SCH acquisition without timing information

< Note: Values to fill the table are proposed in [2] >

Each pattern corresponds to a different compromise between speed of GSM SCH search and rate of use of compressed frames. On upper layers command, the repetition of the selected pattern can be stopped and/or replaced by one of the other listed patterns. Upper layers may also decide to alternate the use of different patterns periods.

Depending on the UE's capabilities, the search procedure may be sequential (tracking of FCCH burst before decoding of the first SCH) or parallel (parallel tracking of FCCH and SCH bursts). The latter solution achieves SCH decoding faster than the first one, thus decreasing the needed number of repeated patterns.

Once the UE has completed the search it signals the UTRAN with FCCH-found or SCH-found, both with the timing of the associated SCH burst, or with FCCH/SCH-not-found (see < *Editor's note : reference to be inserted here* >).

In case of FCCH-found, the UTRAN can continue the current pattern until also SCH is found or stop it and schedule a single, properly aligned gap for SCH search as described in 7.1.3.3.6.4.

Whenever UE receives a new neighbour cell with a sufficiently high power level (see < *Editor's note : reference to be inserted here* >), it shall perform a new SCH search procedure.

When a compressed mode pattern is available, then it is up to the UE to trigger this search procedure with the available transmission gaps. In this case, no specific signalling is needed between the UE and the UTRAN.

When a compressed mode pattern is not available, the UE shall initiate the search procedure by sending a "request new cell search" message to the UTRAN. Based on the UE's capabilities for serial or parallel search as described above, the UTRAN then determines a suitable compressed mode pattern and signals this to the UE. The upper layers can delay the onset of this pattern depending on the timing priority the Network Operator has set for new BSIC identification.

7.1.3.3.6.4 Setting of compressed mode parameters for first SCH decoding with prior timing information between UTRAN serving cells and GSM target cells

UTRAN or UE may have some prior knowledge of timing difference between some FDD cells in UE's active set and some GSM cells in the handover monitoring set. When this information is acquired by the UE (e.g. after initial FCCH/SCH detection) and on upper layers command, the UE shall report it to the upper layers for verification of UTRAN's information, and feedback of this information from UTRAN to the other UE.

When UTRAN or UE have this prior timing information, the compressed mode shall be scheduled by upper layers with the intention that SCH (or FCCH if needed) on a specific GSM band can be decoded at the UE during the transmission gap.

~~In such case, a transmission gap is scheduled once over 306 frames, equal to 13 GSM « 51 multi-frame » duration. As the UTRA 720 ms superframe shifts ¼ of superframe during the period, the 4 times 306 period can be used to fully align the timings of a UTRA FDD and a GSM cells.~~

The transmission gap parameters used for GSM FCCH/SCH tracking with prior timing information are :

TGL	SFN	SN
4	(calculated by UTRAN)	(calculated by UTRAN)

In addition to normal compressed mode parameters, UTRAN signals the following information to the UE :

~~- The frame number where compressed mode occurs (frame number x+n times 306, where n=0,1,2,3)~~

- The GSM carrier for which the particular compressed frame is intended (BS ID, carrier no, etc.)

Once the UE has completed the search, it signals the UTRAN with the timing of the associated SCH burst or with SCH-not-found ~~and the UTRAN ceases the compressed mode pattern~~.

7.1.3.3.6.5 Setting of compressed mode parameters for SCH decoding for BSIC reconfirmation and procedure at the UE

In this paragraph it is assumed that the UE has successfully decoded one SCH burst of a given neighbouring GSM cell during the call.

When a compressed mode pattern is available, then it is up to the UE to trigger and perform the BSIC reconfirmation procedure with the available transmission gaps. In this case, no specific signalling is needed between the UE and the UTRAN for BSIC reconfirmation procedure.

When no compressed mode pattern is available then it is up to the UE to trigger and perform the BSIC reconfirmation procedure. In that case, UE indicates to the upper layers the schedule of the SCH burst of that cell, and the size of the necessary

transmission gap necessary to capture one SCH burst. The Network Operator decides the target time for BSIC reconfirmation and the upper layers uses this and the schedule indicated by the UE to determine the appropriate compressed mode parameters.

~~Depending on whether UTRAN has an a priori timing knowledge of neighbouring GSM cells, t~~The compressed mode parameters shall be one of those described ~~in section 7.1.3.3.6.3, or~~ in section 7.1.3.3.6.4.

4. References

[1] Tdoc R1-99810, Espoo, Finland, 7/99, "Compressed Mode Parameters for UTRA to GSM Handovers", Mitsubishi and Nokia

[2] Tdoc R1-99b14, Hanover, Germany, 8/99, "Textproposal for Compressed Mode Parameters for GSM Search", Mitsubishi, Nokia and Siemens