TSG-RAN Working Group 1 meeting #15
Berlin, Germany
August 22nd – 25th, 2000

TSGR1#15(00)1047

Agenda item: AH99

Source: Ericsson

Title: CR 25.211-066r4: Clarification of paging indicator mapping

Document for: Decision

In TS 25.211 where the mapping of PIs to PICH bits, there is some room for misunderstanding.

It is stated that "the PI calculated by higher layers for use for a certain UE, is mapped to the paging indicator PI_p", which can lead to some misunderstanding, since the value range for PI is 0 … 143 while for PI_p the value range is 0 and 1, and hence "mapping to" sounds incorrect. What is meant is that the PI is *associated* with PI_p.

Further, as explained in TS 25.435, the frame protocol specification for common channels, the paging indications are carried over Iub by the frame protocol in a *PI bitmap*. The PI bitmap indicates if a certain PI is to be set to 0 or 1, for all PIs. Since 25.435 talks about PIs and not PICH bits, it is to be understood that the circular shifting of the PIs calculated by higher layers before mapping to PICH bits is to be done by Node B. It is proposed to further clarify this in the specification to avoid misunderstandings.

Further, in TS 25.435 the notation PI0, PI1 etc. is used, which is a bit unfortunate since PI_0, PI_1 etc. is used in TS 25.211, and different things are meant (in TS 25.211 the PI_p is *after* the shifting). To avoid this PI_p is renamed P_p.

This CR introduces the proposed changes to TS 25.211.

In revision 1 of the CR, the abbreviation "PI" has been removed in the Table 22 heading, and the abbreviation PI has been removed from the abbreviation list.

In revision 2 of the CR, the parameter N has been renamed Np to be inline with WG2 specification TS 25.304. Since this notation includes a "p" it is proposed that the WG1 internal variable "p" is renamed "q" to avoid confusion within this section.

In revision 3 of the CR, some forgotten "N" were changed into "Np".

In revision 4 of the CR, "p" was replaced with "q" in table 22, since this was forgotten in revision 2 of the CR.

3GPP TSG RAN WG1#15
Berlin, Germany, August 22nd – 25th 2000

Document R1-00-1047
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.211	CR	066r4	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: RAN#9 *list expected approval meeting # here ↑*

for approval [X]
for information [ ]

strategic [ ]
non-strategic [ ]
(for SMG use only)

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)* (U)SIM [ ] ME [X] UTRAN / Radio [X] Core Network [ ]

Source: Ericsson **Date:** 2000-07-07

Subject: Clarification of paging indicator mapping

Work item:

Category: *(only one category Shall be marked With an X)*

F	Correction	[X]
A	Corresponds to a correction in an earlier release	[ ]
B	Addition of feature	[ ]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Release:

Phase 2	[ ]
Release 96	[ ]
Release 97	[ ]
Release 98	[ ]
Release 99	[X]
Release 00	[ ]

Reason for change: Clarification of how the PIs arriving to Node B in the PI bitmap over the frame protocol are mapped to PICH bits.

Clauses affected:

Other specs Affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other GSM core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

<--------- double-click here for help and instructions on how to create a CR.

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AI	Acquisition Indicator
AICH	Acquisition Indicator Channel
AP	Access Preamble
AP-AICH	Access Preamble Acquisition Indicator Channel
API	Access Preamble Indicator
BCH	Broadcast Channel
CA	Channel Assignment
CAI	Channel Assignment Indicator
CCC	CPCH Control Command
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Collision Detection
CD/CA-ICH	Collision Detection/Channel Assignment Indicator Channel
CDI	Collision Detection Indicator
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
CSICH	CPCH Status Indicator Channel
DCH	Dedicated Channel
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
DSCH	Downlink Shared Channel
DSMA-CD	Digital Sense Multiple Access - Collison Detection
DTX	Discontinuous Transmission
FACH	Forward Access Channel
FBI	Feedback Information
FSW	Frame Synchronization Word
ICH	Indicator Channel
MUI	Mobile User Identifier
PCH	Paging Channel
P-CCPCH	Primary Common Control Physical Channel
PCPCH	Physical Common Packet Channel
PDSCH	Physical Downlink Shared Channel
~~PI~~	~~Page Indicator~~
PICH	Page Indicator Channel
PRACH	Physical Random Access Channel
PSC	Primary Synchronisation Code
RACH	Random Access Channel
RNC	Radio Network Controller
S-CCPCH	Secondary Common Control Physical Channel
SCH	Synchronisation Channel
SF	Spreading Factor
SFN	System Frame Number
SI	Status Indicator
SSC	Secondary Synchronisation Code
STTD	Space Time Transmit Diversity
TFCI	Transport Format Combination Indicator
TSTD	Time Switched Transmit Diversity
TPC	Transmit Power Control
UE	User Equipment
UTRAN	UMTS Terrestrial Radio Access Network

5.3.3.9 Paging Indicator Channel (PICH)

The Paging Indicator Channel (PICH) is a fixed rate (SF=256) physical channel used to carry the pPaging iIndicators (PI). The PICH is always associated with an S-CCPCH to which a PCH transport channel is mapped.

Figure 24 illustrates the frame structure of the PICH. One PICH radio frame of length 10 ms consists of 300 bits (b_0, b_1, …, b_{299}). Of these, 288 bits (b_0, b_1, …, b_{287}) are used to carry pPaging iIndicators. The remaining 12 bits are not formally part of the PICH and shall not be transmitted. The part of the frame with no transmission is reserved for possible future use.

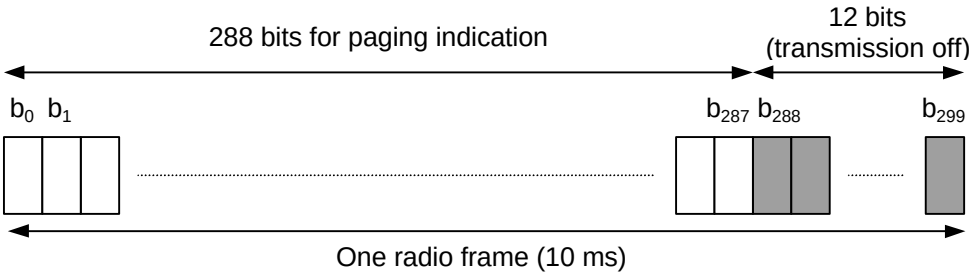

Figure 24: Structure of Paging Indicator Channel (PICH)

In each PICH frame, Np pPaging iIndicators {PI_0, …, PI_{N_p-1}} are transmitted in each PICH frame, where Np=18, 36, 72, or 144.

The PI calculated by higher layers for use for a certain UE, is associatedmapped to the paging indicator PI_{pq}, where *qp* is computed as a function of the PI computed by higher layers, the SFN of the P-CCPCH radio frame during which the start of the PICH radio frame occurs, and the number of paging indicators per frame (Np):

$$p = \left(PI + \left\lfloor \left(\left(18 \times \left(SFN + \lfloor SFN/8 \rfloor + \lfloor SFN/64 \rfloor + \lfloor SFN/512 \rfloor \right) \right) \bmod 144 \right) \times \frac{N}{144} \right\rfloor \right) \bmod N .$$

$$q = \left(PI + \left\lfloor \left(\left(18 \times \left(SFN + \lfloor SFN/8 \rfloor + \lfloor SFN/64 \rfloor + \lfloor SFN/512 \rfloor \right) \right) \bmod 144 \right) \times \frac{Np}{144} \right\rfloor \right) \bmod Np$$

Further, the PI calculated by higher layers is associated with the value of the paging indicator P_q. If a paging indicator in a certain frame is set to "1" it is an indication that UEs associated with this paging indicator and PI should read the corresponding frame of the associated S-CCPCH.

The PI bitmap in the PCH data frames over Iub contains indication values for all higher layer PI values possible. Each bit in the bitmap indicates if the paging indicator associated with that particular PI shall be set to 0 or 1. Hence, the calculation in the formula above is to be performed in Node B to make the association between PI and P_q.

The mapping from {PI_0, …, PI_{N_p-1}} to the PICH bits {b_0, …, b_{287}} are according to table 22.

Table 22: Mapping of Ppaging Iindicators P_q(PI) to PICH bits

Number of paging indicatorsPI per frame (Np)	PI_{pq} = 1	PI_{pq} = 0
Np=18	$\{b_{16qp}, \ldots, b_{16qp+15}\} = \{-1,-1,\ldots,-1\}$	$\{b_{16qp}, \ldots, b_{16qp+15}\} = \{+1,+1,\ldots,+1\}$
Np=36	$\{b_{8qp}, \ldots, b_{8qp+7}\} = \{-1,-1,\ldots,-1\}$	$\{b_{8qp}, \ldots, b_{8qp+7}\} = \{+1,+1,\ldots,+1\}$
Np=72	$\{b_{4qp}, \ldots, b_{4qp+3}\} = \{-1,-1,\ldots,-1\}$	$\{b_{4qp}, \ldots, b_{4qp+3}\} = \{+1,+1,\ldots,+1\}$
Np=144	$\{b_{2qp}, b_{2qp+1}\} = \{-1,-1\}$	$\{b_{2qp}, b_{2qp+1}\} = \{+1,+1\}$

If a Paging Indicator in a certain frame is set to "1" it is an indication that UEs associated with this Paging Indicator should read the corresponding frame of the associated S-CCPCH.

When transmit diversity is employed for the PICH, STTD encoding is used on the PICH bits as described in subclause 5.3.1.1.1.