TSG-RAN Meeting #15
Jeju-do, Korea, 5 - 8 March 2002

RP-020063

Title: **Agreed CRs (Release '99 and Rel-4 category A) to TS 25.304**

Source: **TSG-RAN WG2**

Agenda item: **7.2.3**

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-020257	agreed	25.304	095		R99	Correction to TDD paging message receiving occasion	F	3.9.0	3.10.0
R2-020448	agreed	25.304	096		Rel-4	Correction to TDD paging message receiving occasion	A	4.3.0	4.4.0
R2-020410	agreed	25.304	097	1	R99	Clarification of IMSI at Paging channel selection and DRX calculation	F	3.9.0	3.10.0
R2-020555	agreed	25.304	098		Rel-4	Clarification of IMSI at Paging channel selection and DRX calculation	A	4.3.0	4.4.0

3GPP TSG-RAN2 Meeting #27
Orlando, USA, 18-22 February

R2-020257

CR-Form-v4

CHANGE REQUEST

⌘ **25.304** **CR** **095** ⌘ ev **-** ⌘ Current version: **3.9.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Correction to TDD paging message receiving occasion
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	11/2/2002
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The current function to determine the paging message location is such that it is likely that only a limited number of the defined PCHs will be used, i.e. there will not be an even spread of users across all defined PCHs.
Summary of change:	⌘	The paging occasion receiving message occasion is modified in order to obtain a good spread of selected paging groups. Isolated Impact Analysis: Correction to a function where the specification was: • Erroneous • This change has an isolated impact
Consequences if not approved:	⌘	Unless a very wide spread of IMSIs are allocated, all UEs will select the same paging message receiving occasion.

Clauses affected:	⌘	8.3		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.304 v4.3.0, CR 096
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.3 Discontinuous Reception

The UE may use Discontinuous Reception (DRX) in idle mode in order to reduce power consumption. When DRX is used the UE needs only to monitor one Page Indicator, PI, (see definition in [7] and [8]) in one Paging Occasion per DRX cycle.

The DRX cycle length shall be MAX(2^k, PBP) frames, where k is an integer and PBP is the Paging Block Periodicity. PBP is only applicable for TDD and is equal to the PICH repetition period that is broadcast in system information. For FDD, PBP=1.

The UE may be attached to different CN domains with different CN domain specific DRX cycle lengths. The UE shall store each CN domain specific DRX cycle length for each CN domain the UE is attached to and use the shortest of those DRX cycle lengths. The CS CN specific DRX cycle length coefficient shall be updated locally in the UE using information given in system information. On the other hand, the PS CN specific DRX cycle length coefficient shall be updated after the negotiation between the UE and PS CN by NAS procedure. If no specific value "k" is negotiated in NAS procedure, the UE and PS CN shall use the DRX cycle length given for PS CN domain in system information.

The DRX cycle lengths to use for UTRAN connected mode is the shortest of the following:

- UTRAN DRX cycle length;
- any of the stored CN domain specific DRX cycle length for the CN domains the UE is only attached to with no signalling connection established.

The UE shall use the IMSI, the number of available SCCPCH which carry a PCH (K) as derived according to subclause 8.1,the Cell System Frame Number (SFN), Np (for FDD, Np is the number of page indicators within a frame; for TDD, Np is the number of page indicators within a paging block), Frame offset (For FDD, Frame offset = 0; for TDD, PICH frame offset values are given in system information), PBP and the DRX cycle length to determine the Paging Occasions.

In FDD the UE shall monitor its paging indicator in the PICH frame with SFN given by the Paging Occasion

In TDD the UE shall monitor its paging indicator in the paging block given by the Paging Occasion. The Paging Occasion gives the SFN of the first frame of the paging block.

The value of the Paging Occasion is determined as follows:

Paging Occasion= {(IMSI div K) mod (DRX cycle length div PBP)} * PBP + n * DRX cycle length + Frame Offset

Where n = 0,1,2… as long as SFN is below its maximum value.

The actual Page Indicator within a Paging Occasion that the UE shall read is similarly determined based on IMSI.

The Page Indicator to use is calculated by using the following formula:

PI = DRX Index mod Np

where DRX Index = IMSI div 8192

In FDD mode, Np = (18,36,72,144) is the number of Page Indicators per frame, and is given in IE "Number of PI per frame", part of system information in FDD mode. In TDD mode, Np is the number of Page Indicators per paging block and is calculated by the Paging Indicator Length $L_{PI,}$ the Burst Type (long or short midamble) and the PICH repetition length, which are given in system information.

If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default numbers, IMSI = 0 and DRX cycle length = 256 (2.56 s), in the formulas above.

For FDD, see [7] for details about the timing between a PICH frame and when the paging message is transmitted on the PCH in the associated S-CCPCH frame.

In TDD mode, the Paging Message Receiving Occasion is calculated using the following formula:

Paging Message Receiving Occasion =Paging Occasion + N_{PICH} + N_{GAP} + {(DRX Index mod ~~div~~ Np) mod N_{PCH} } *2

The value N_{PICH} is the number of frames for PICH transmission and is equal to the PICH repetition length given in system information. The value N_{GAP} is the number of frames between the last frame carrying PICH for this Paging Occasion and the first frame carrying paging messages for this Paging Occasion. The value N_{PCH} is the number of Paging Groups. N_{PCH} and N_{GAP} are given in system information.

3GPP TSG-RAN2 Meeting #27
Orlando, USA, 18-22 of February

R2-020555

CR-Form-v5

CHANGE REQUEST

⌘ **25.304** **CR** **098** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Clarification of IMSI at Paging channel selection and DRX calculation
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-02-22
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

At "Paging channel selection" (section 8.1) and "DRX cycle length calculation" (section 8.3), the IMSI interpretation to be used in the calculation is not explicitly stated. In case of miss-interpretation, this would give interoperability problems, since paging will fail.

Example:

IMSI (GSM-MAP) = 12 (digit1=1, digit2=2)

In the calculations, this shall be interpreted as the integer "12", not "1x16+2 = 18".

Summary of change: ⌘

The interpretation of IMSI is clarified for "Paging channel selection" and "DRX cycle length calculation".
For GSM-MAP, IMSI shall be interpreted as an integer number, where the first digit given in the sequence represents the highest order digit.
For DS-41, IMSI shall correspond to the decoded decimal representation of the IMSI-S part included in the octet string (see TIA/EIA/IS-2000-5).

Impact analysis:

Impacted functionality: "Paging channel selection" and "DRX cycle length calculation"

Correction: Clarification on how UE and UTRAN shall interpret IMSI.

Correction to a function where the specification is ambiguous. Would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise

Consequences if not approved: ⌘

Risk for miss-interpretation and interoperability problems. Paging will fail.

Clauses affected: ⌘ 8.1, 8.3

Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.304 v3.9.0, CR 097r1	
Other comments:	⌘				

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8 Paging and SCCPCH selection

8.1 Paging Channel selection

System information block type 5 (SIB 5) defines common channels to be employed in Idle mode [4]. In a cell, a single or several PCHs may be established. Each Secondary Common Control Physical Channel (SCCPCH) indicated to the UE in system information may carry up to one PCH. Thus, for each defined PCH there is one uniquely associated PICH also indicated.

In case that more than a single PCH and associated PICH are defined in SIB 5, the UE shall perform a selection according to the following rule:

- The UE shall select a SCCPCH from the ones listed in SIB 5 based on IMSI as follows:

"Index of selected SCCPCH" = IMSI mod K,

where K is equal to the number of listed SCCPCHs which carry a PCH (i.e. SCCPCHs carrying FACH only shall not be counted). These SCCPCHs shall be indexed in the order of their occurrence in SIB 5 from 0 to K-1.
For GSM-MAP, i.e. "IMSI (GSM-MAP)" is given as sequence of digits of type Integer(0..9), IMSI shall in the formula above be interpreted as a ~~n~~ decimal integer number, where the first digit given in the sequence represents the highest order digit.
For DS-41, i.e."IMSI (DS-41)" is given as octet string, IMSI shall in the formulae above correspond to the decoded decimal representation of the IMSI-S part included in the octet string (see TIA/EIA/IS-2000-5).

For example:

IMSI (GSM-MAP) = 12 (digit1=1, digit2=2)

In the calculations, this shall be interpreted as the decimal integer “12”, not “1x16+2 = 18”.

"Index of selected SCCPCH" identifies the selected SCCPCH with the PCH and the uniquely associated PICH to be used by the UE.

If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default number IMSI = 0.

8.2 SCCPCH selection when entering Connected mode

When entering Connected mode from Idle mode by sending an RRC CONNECTION REQUEST message, the UE shall select the S-CCPCH which carries an FACH to be used for reception of the RRC CONNECTION SETUP message according to the following rule:

- the UE shall select an SCCPCH from the SCCPCHs listed in System Information Block type 5 (SIB 5) based on "Initial UE Identity" as follows:

"Index of selected SCCPCH" = "Initial UE Identity" mod K,

where K is equal to the number of listed SCCPCHs which carry a FACH (i.e. SCCPCHs carrying PCH only shall not be counted). These SCCPCHs shall be indexed from 0 to K-1 in the order of their occurrence in SIB 5, and "Index of selected SCCPCH" identifies the selected SCCPCH. "Initial UE Identity" refers to the Information Element included by the UE into the RRC CONNECTION REQUEST message. In the above formula, the parameter "Initial UE Identity" shall be interpreted as follows, depending on the choice of UE-Id type of the respective IE:

For UE-Id type "IMSI (GSM-MAP)", i.e. the IE is given as sequence of digits of type Integer(0..9), "Initial UE Identity" shall be interpreted as an integer number, where the first digit given in the sequence represents the highest order digit.

For UE-Id types "TMSI and LAI (GSM-MAP)" or "P-TMSI and RAI (GSM-MAP)", only the TMSI or P-TMSI parts given as Bitstring(32) shall be used, and "Initial UE Identity" shall be interpreted as a binary representation of an integer number, where the first bit in the Bitstring represents the highest order bit.

For UE-Id type "IMEI", i.e. the IE is given as sequence of hexadecimal digits of type Integer(0..15), "Initial UE Identity" shall be interpreted as a hexadecimal representation of an integer number, where the first digit given in the sequence represents the highest order digit.

For UE-Id type "IMSI (DS-41)", i.e. the IE is given as octet string, "Initial UE Identity" shall correspond to the decoded decimal representation of the IMSI-S part included in the octet string (see TIA/EIA/IS-2000-5).

For UE-Id types "ESN (DS-41)" or "TMSI (DS-41)", i.e. the IE is given as Bitstring(32), "Initial UE Identity" shall be interpreted as a binary representation of an integer number, where the first bit in the Bitstring represents the highest order bit.

For UE-Id type "IMSI and ESN (DS-41)" only the ESN part shall be used as "Initial UE Identity", as defined above.

8.3 Discontinuous Reception

The UE may use Discontinuous Reception (DRX) in idle mode in order to reduce power consumption. When DRX is used the UE needs only to monitor one Page Indicator, PI, (see definition in [7] and [8]) in one Paging Occasion per DRX cycle.

The DRX cycle length shall be MAX(2^k, PBP) frames, where k is an integer and PBP is the Paging Block Periodicity. PBP is only applicable for TDD and is equal to the PICH repetition period that is broadcast in system information. For FDD, PBP=1.

The UE may be attached to different CN domains with different CN domain specific DRX cycle lengths. The UE shall store each CN domain specific DRX cycle length for each CN domain the UE is attached to and use the shortest of those DRX cycle lengths. The CS CN specific DRX cycle length coefficient shall be updated locally in the UE using information given in system information. On the other hand, the PS CN specific DRX cycle length coefficient shall be updated after the negotiation between the UE and PS CN by NAS procedure. If no specific value "k" is negotiated in NAS procedure, the UE and PS CN shall use the DRX cycle length given for PS CN domain in system information.

The DRX cycle lengths to use for UTRAN connected mode is the shortest of the following:

- UTRAN DRX cycle length;
- any of the stored CN domain specific DRX cycle length for the CN domains the UE is only attached to with no signalling connection established.

The UE shall use the IMSI, the number of available SCCPCH which carry a PCH (K) as derived according to subclause 8.1,the Cell System Frame Number (SFN), Np (for FDD, Np is the number of page indicators within a frame; for TDD, Np is the number of page indicators within a paging block), Frame offset (For FDD, Frame offset = 0; for TDD, PICH frame offset values are given in system information), PBP and the DRX cycle length to determine the Paging Occasions.

In FDD the UE shall monitor its paging indicator in the PICH frame with SFN given by the Paging Occasion

In TDD the UE shall monitor its paging indicator in the paging block given by the Paging Occasion. The Paging Occasion gives the SFN of the first frame of the paging block.

The value of the Paging Occasion is determined as follows:

Paging Occasion= {(IMSI div K) mod (DRX cycle length div PBP)} * PBP + n * DRX cycle length + Frame Offset

Where n = 0,1,2… as long as SFN is below its maximum value.

The actual Page Indicator within a Paging Occasion that the UE shall read is similarly determined based on IMSI.

The Page Indicator to use is calculated by using the following formula:

PI = DRX Index mod Np

where DRX Index = IMSI div 8192

In FDD mode, Np = (18,36,72,144) is the number of Page Indicators per frame, and is given in IE "Number of PI per frame", part of system information in FDD mode. In TDD mode, Np is the number of Page Indicators per paging block and is calculated by the Paging Indicator Length $L_{PI,}$ the Burst Type (long or short midamble) and the PICH repetition length, which are given in system information.

If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default numbers, IMSI = 0 and DRX cycle length = 256 (2.56 s), in the formulas above.

For FDD, see [7] for details about the timing between a PICH frame and when the paging message is transmitted on the PCH in the associated S-CCPCH frame.

In TDD mode, the Paging Message Receiving Occasion is calculated using the following formula:

Paging Message Receiving Occasion =Paging Occasion + N_{PICH} + N_{GAP} + {(DRX Index div Np) mod N_{PCH} } *2

The value N_{PICH} is the number of frames for PICH transmission and is equal to the PICH repetition length given in system information. The value N_{GAP} is the number of frames between the last frame carrying PICH for this Paging Occasion and the first frame carrying paging messages for this Paging Occasion. The value N_{PCH} is the number of Paging Groups. N_{PCH} and N_{GAP} are given in system information.

For GSM-MAP, i.e. "IMSI (GSM-MAP)" is given as sequence of digits of type Integer(0..9), IMSI shall in the formulae above be interpreted as a~~n~~ decimal integer number, where the first digit given in the sequence represents the highest order digit.
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For example:

IMSI (GSM-MAP) = 12 (digit1=1, digit2=2)

In the calculations, this shall be interpreted as the decimal integer “12”, not “1x16+2 = 18”.

3GPP TSG-RAN2 Meeting #27
Orlando, USA, 18-22 of February

R2-020410

CR-Form-v5

CHANGE REQUEST

⌘ **25.304** **CR** **097** ⌘ **rev** **r1** ⌘ Current version: **3.9.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Clarification of IMSI at Paging channel selection and DRX calculation
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	2002-02-22
Category:	⌘	**F**
Release:	⌘	R99

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Reason for change: ⌘

At "Paging channel selection" (section 8.1) and "DRX cycle length calculation" (section 8.3), the IMSI interpretation to be used in the calculation is not explicitly stated. In case of miss-interpretation, this would give interoperability problems, since paging will fail.

Example:

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Summary of change: ⌘

The interpretation of IMSI is clarified for "Paging channel selection" and "DRX cycle length calculation".
For GSM-MAP, IMSI shall be interpreted as an integer number, where the first digit given in the sequence represents the highest order digit.
For DS-41, IMSI shall correspond to the decoded decimal representation of the IMSI-S part included in the octet string (see TIA/EIA/IS-2000-5).

Impact analysis:

Impacted functionality: "Paging channel selection" and "DRX cycle length calculation"

Correction: Clarification on how UE and UTRAN shall interpret IMSI.

Correction to a function where the specification is ambiguous. Would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise

Consequences if not approved: ⌘

Risk for miss-interpretation and interoperability problems. Paging will fail.

Clauses affected: ⌘ 8.1, 8.3

Other specs affected:	⌘	☐	Other core specifications Test specifications O&M Specifications	⌘	25.304 v4.3.0, CR 098
Other comments:	⌘				

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8 Paging and SCCPCH selection

8.1 Paging Channel selection

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In case that more than a single PCH and associated PICH are defined in SIB 5, the UE shall perform a selection according to the following rule:

- The UE shall select a SCCPCH from the ones listed in SIB 5 based on IMSI as follows:

"Index of selected SCCPCH" = IMSI mod K,

where K is equal to the number of listed SCCPCHs which carry a PCH (i.e. SCCPCHs carrying FACH only shall not be counted). These SCCPCHs shall be indexed in the order of their occurrence in SIB 5 from 0 to K-1.
For GSM-MAP, i.e. "IMSI (GSM-MAP)" is given as sequence of digits of type Integer(0..9), IMSI shall in the formula above be interpreted as a ~~n~~ decimal integer number, where the first digit given in the sequence represents the highest order digit.
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For example:

IMSI (GSM-MAP) = 12 (digit1=1, digit2=2)

In the calculations, this shall be interpreted as the decimal integer “12”, not “1x16+2 = 18”.

"Index of selected SCCPCH" identifies the selected SCCPCH with the PCH and the uniquely associated PICH to be used by the UE.

If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default number IMSI = 0.

8.2 SCCPCH selection when entering Connected mode

When entering Connected mode from Idle mode by sending an RRC CONNECTION REQUEST message, the UE shall select the S-CCPCH which carries an FACH to be used for reception of the RRC CONNECTION SETUP message according to the following rule:

- the UE shall select an SCCPCH from the SCCPCHs listed in System Information Block type 5 (SIB 5) based on "Initial UE Identity" as follows:

"Index of selected SCCPCH" = "Initial UE Identity" mod K,

where K is equal to the number of listed SCCPCHs which carry a FACH (i.e. SCCPCHs carrying PCH only shall not be counted). These SCCPCHs shall be indexed from 0 to K-1 in the order of their occurrence in SIB 5, and "Index of selected SCCPCH" identifies the selected SCCPCH. "Initial UE Identity" refers to the Information Element included by the UE into the RRC CONNECTION REQUEST message. In the above formula, the parameter "Initial UE Identity" shall be interpreted as follows, depending on the choice of UE-Id type of the respective IE:

For UE-Id type "IMSI (GSM-MAP)", i.e. the IE is given as sequence of digits of type Integer(0..9), "Initial UE Identity" shall be interpreted as an integer number, where the first digit given in the sequence represents the highest order digit.

For UE-Id types "TMSI and LAI (GSM-MAP)" or "P-TMSI and RAI (GSM-MAP)", only the TMSI or P-TMSI parts given as Bitstring(32) shall be used, and "Initial UE Identity" shall be interpreted as a binary representation of an integer number, where the first bit in the Bitstring represents the highest order bit.

For UE-Id type "IMEI", i.e. the IE is given as sequence of hexadecimal digits of type Integer(0..15), "Initial UE Identity" shall be interpreted as a hexadecimal representation of an integer number, where the first digit given in the sequence represents the highest order digit.

For UE-Id type "IMSI (DS-41)", i.e. the IE is given as octet string, "Initial UE Identity" shall correspond to the decoded decimal representation of the IMSI-S part included in the octet string (see TIA/EIA/IS-2000-5).

For UE-Id types "ESN (DS-41)" or "TMSI (DS-41)", i.e. the IE is given as Bitstring(32), "Initial UE Identity" shall be interpreted as a binary representation of an integer number, where the first bit in the Bitstring represents the highest order bit.

For UE-Id type "IMSI and ESN (DS-41)" only the ESN part shall be used as "Initial UE Identity", as defined above.

8.3 Discontinuous Reception

The UE may use Discontinuous Reception (DRX) in idle mode in order to reduce power consumption. When DRX is used the UE needs only to monitor one Page Indicator, PI, (see definition in [7] and [8]) in one Paging Occasion per DRX cycle.

The DRX cycle length shall be MAX(2^k, PBP) frames, where k is an integer and PBP is the Paging Block Periodicity. PBP is only applicable for TDD and is equal to the PICH repetition period that is broadcast in system information. For FDD, PBP=1.

The UE may be attached to different CN domains with different CN domain specific DRX cycle lengths. The UE shall store each CN domain specific DRX cycle length for each CN domain the UE is attached to and use the shortest of those DRX cycle lengths. The CS CN specific DRX cycle length coefficient shall be updated locally in the UE using information given in system information. On the other hand, the PS CN specific DRX cycle length coefficient shall be updated after the negotiation between the UE and PS CN by NAS procedure. If no specific value "k" is negotiated in NAS procedure, the UE and PS CN shall use the DRX cycle length given for PS CN domain in system information.

The DRX cycle lengths to use for UTRAN connected mode is the shortest of the following:

- UTRAN DRX cycle length;
- any of the stored CN domain specific DRX cycle length for the CN domains the UE is only attached to with no signalling connection established.

The UE shall use the IMSI, the number of available SCCPCH which carry a PCH (K) as derived according to subclause 8.1,the Cell System Frame Number (SFN), Np (for FDD, Np is the number of page indicators within a frame; for TDD, Np is the number of page indicators within a paging block), Frame offset (For FDD, Frame offset = 0; for TDD, PICH frame offset values are given in system information), PBP and the DRX cycle length to determine the Paging Occasions.

In FDD the UE shall monitor its paging indicator in the PICH frame with SFN given by the Paging Occasion

In TDD the UE shall monitor its paging indicator in the paging block given by the Paging Occasion. The Paging Occasion gives the SFN of the first frame of the paging block.

The value of the Paging Occasion is determined as follows:

Paging Occasion= {(IMSI div K) mod (DRX cycle length div PBP)} * PBP + n * DRX cycle length + Frame Offset

Where n = 0,1,2… as long as SFN is below its maximum value.

The actual Page Indicator within a Paging Occasion that the UE shall read is similarly determined based on IMSI.

The Page Indicator to use is calculated by using the following formula:

PI = DRX Index mod Np

where DRX Index = IMSI div 8192

In FDD mode, Np = (18,36,72,144) is the number of Page Indicators per frame, and is given in IE "Number of PI per frame", part of system information in FDD mode. In TDD mode, Np is the number of Page Indicators per paging block and is calculated by the Paging Indicator Length $L_{PI,}$ the Burst Type (long or short midamble) and the PICH repetition length, which are given in system information.

If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default numbers, IMSI = 0 and DRX cycle length = 256 (2.56 s), in the formulas above.

For FDD, see [7] for details about the timing between a PICH frame and when the paging message is transmitted on the PCH in the associated S-CCPCH frame.

In TDD mode, the Paging Message Receiving Occasion is calculated using the following formula:

Paging Message Receiving Occasion =Paging Occasion + N_{PICH} + N_{GAP} + {(DRX Index div Np) mod N_{PCH} } *2

The value N_{PICH} is the number of frames for PICH transmission and is equal to the PICH repetition length given in system information. The value N_{GAP} is the number of frames between the last frame carrying PICH for this Paging Occasion and the first frame carrying paging messages for this Paging Occasion. The value N_{PCH} is the number of Paging Groups. N_{PCH} and N_{GAP} are given in system information.

For GSM-MAP, i.e. "IMSI (GSM-MAP)" is given as sequence of digits of type Integer(0..9), IMSI shall in the formulae above be interpreted as a~~n~~ decimal integer number, where the first digit given in the sequence represents the highest order digit.
For DS-41, i.e."IMSI (DS-41)" is given as octet string, IMSI shall in the formulae above correspond to the decoded decimal representation of the IMSI-S part included in the octet string (see TIA/EIA/IS-2000-5).

For example:

IMSI (GSM-MAP) = 12 (digit1=1, digit2=2)

In the calculations, this shall be interpreted as the decimal integer “12”, not “1x16+2 = 18”.

3GPP TSG-RAN2 Meeting #27
Orlando, USA, 18-22 February

R2-020448

CR-Form-v4

CHANGE REQUEST

⌘ **25.304 CR 096** ⌘ ev **-** ⌘ Current version: **4.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Correction to TDD paging message receiving occasion
Source:	⌘	TSG-RAN WG2
Work item code:	⌘	TEI
Date:	⌘	21/2/2002
Category:	⌘	**A**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The current function to determine the paging message location is such that it is likely that only a limited number of the defined PCHs will be used, i.e. there will not be an even spread of users across all defined PCHs.
Summary of change:	⌘	The paging occasion receiving message occasion is modified in order to obtain a good spread of selected paging groups. Isolated Impact Analysis: Correction to a function where the specification was: • Erroneous • This change has an isolated impact
Consequences if not approved:	⌘	Unless a very wide spread of IMSIs are allocated, all UEs will select the same paging message receiving occasion.

Clauses affected:	⌘	8.3		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.304 v3.9.0, CR 095
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.3 Discontinuous Reception

The UE may use Discontinuous Reception (DRX) in idle mode in order to reduce power consumption. When DRX is used the UE needs only to monitor one Page Indicator, PI, (see definition in [7] and [8]) in one Paging Occasion per DRX cycle.

The DRX cycle length shall be MAX(2^k, PBP) frames, where k is an integer and PBP is the Paging Block Periodicity. PBP is only applicable for TDD and is equal to the PICH repetition period that is broadcast in system information. For FDD, PBP=1.

The UE may be attached to different CN domains with different CN domain specific DRX cycle lengths. The UE shall store each CN domain specific DRX cycle length for each CN domain the UE is attached to and use the shortest of those DRX cycle lengths. The CS CN specific DRX cycle length coefficient shall be updated locally in the UE using information given in system information. On the other hand, the PS CN specific DRX cycle length coefficient shall be updated after the negotiation between the UE and PS CN by NAS procedure. If no specific value "k" is negotiated in NAS procedure, the UE and PS CN shall use the DRX cycle length given for PS CN domain in system information.

The DRX cycle lengths to use for UTRAN connected mode is the shortest of the following:

- UTRAN DRX cycle length;
- any of the stored CN domain specific DRX cycle length for the CN domains the UE is only attached to with no signalling connection established.

The UE shall use the IMSI, the number of available SCCPCH which carry a PCH (K) as derived according to subclause 8.1,the Cell System Frame Number (SFN), Np (for FDD, Np is the number of page indicators within a frame; for TDD, Np is the number of page indicators within a paging block), Frame offset (For FDD, Frame offset = 0; for TDD, PICH frame offset values are given in system information), PBP and the DRX cycle length to determine the Paging Occasions.

In FDD the UE shall monitor its paging indicator in the PICH frame with SFN given by the Paging Occasion

In TDD the UE shall monitor its paging indicator in the paging block given by the Paging Occasion. The Paging Occasion gives the SFN of the first frame of the paging block.

The value of the Paging Occasion is determined as follows:

Paging Occasion= {(IMSI div K) mod (DRX cycle length div PBP)} * PBP + n * DRX cycle length + Frame Offset

Where n = 0,1,2… as long as SFN is below its maximum value.

The actual Page Indicator within a Paging Occasion that the UE shall read is similarly determined based on IMSI.

The Page Indicator to use is calculated by using the following formula:

PI = DRX Index mod Np

where DRX Index = IMSI div 8192

In FDD mode, Np = (18,36,72,144) is the number of Page Indicators per frame, and is given in IE "Number of PI per frame", part of system information in FDD mode. In TDD mode, Np is the number of Page Indicators per paging block and is calculated by the Paging Indicator Length $L_{PI,}$ the Burst Type (long or short midamble for 3.84 Mcps TDD) and the PICH repetition length, which are given in system information.

If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default numbers, IMSI = 0 and DRX cycle length = 256 (2.56 s), in the formulas above.

For FDD, see [7] for details about the timing between a PICH frame and when the paging message is transmitted on the PCH in the associated S-CCPCH frame.

In TDD mode, the Paging Message Receiving Occasion is calculated using the following formula:

Paging Message Receiving Occasion =Paging Occasion + N_{PICH} + N_{GAP} + {(DRX Index ~~div~~mod Np) mod N_{PCH} } *2

The value N_{PICH} is the number of frames for PICH transmission and is equal to the PICH repetition length given in system information. The value N_{GAP} is the number of frames between the last frame carrying PICH for this Paging Occasion and the first frame carrying paging messages for this Paging Occasion. The value N_{PCH} is the number of Paging Groups. N_{PCH} and N_{GAP} are given in system information.