TSG-RAN Meeting #13
Beijing, China, 18 - 21 September 2001

RP-010539

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

Source: TSG-RAN WG2

Agenda item: 8.2.3

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-011856	agreed	25.304	079		R99	Clarification to usage of measurement thresholds for HCS	F	3.7.0	3.8.0
R2-012011	agreed	25.304	080		Rel-4	Clarification to usage of measurement thresholds for HCS	A	4.1.0	4.2.0
R2-011901	agreed	25.304	081		R99	Definition of strongest cell in cell search procedures	F	3.7.0	3.8.0
R2-012012	agreed	25.304	082		Rel-4	Definition of strongest cell in cell search procedures	A	4.1.0	4.2.0
R2-012013	agreed	25.304	083	1	R99	Miscellaneous corrections	F	3.7.0	3.8.0
R2-012014	agreed	25.304	084		Rel-4	Miscellaneous corrections	A	4.1.0	4.2.0
R2-011944	agreed	25.304	085		R99	Correction to cells reserved for operator use	F	3.7.0	3.8.0
R2-012133	agreed	25.304	086		Rel-4	Correction to cells reserved for operator use	A	4.1.0	4.2.0
R2-012134	agreed	25.304	087	1	R99	Service type also valid in connected mode	F	3.7.0	3.8.0
R2-012176	agreed	25.304	088		Rel-4	Service type also valid in connected mode	A	4.1.0	4.2.0
R2-012139	agreed	25.304	089		R99	Cell Access Restrictions for emergency calls	F	3.7.0	3.8.0
R2-012189	agreed	25.304	090		Rel-4	Cell Access Restrictions for emergency calls	A	4.1.0	4.2.0

CR-Form-v4

CHANGE REQUEST

⌘   **25.304 CR**   **079** ⌘ ev **-** ⌘   Current version: **3.7.0** ⌘

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

Title: ⌘	Clarification to usage of measurement thresholds for HCS	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ 27 August 2001

Category: ⌘   **F**   ***Release:*** ⌘   R99

Use <u>one</u> 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 <u>one</u> 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: ⌘	For measurement rules in HCS, it is currently specified that: "If HCS is used and if $S_{intersearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells." This is however only true for FDD cells, because Sintersearch is not used in HCS measurement rules for TDD. Furthermore, UE behaviour is clarified if optional information element $S_{SearchHCS}$ is not sent for the serving cell.

Summary of change: ⌘	- Clarification that Sintersearch is not used for TDD HCS measurement thresholds.
	
	- Clarification that UE shall measure on all intra- and inter-frequency cells if $S_{SearchHCS}$ is not sent for the serving cell.
	
	Isolated Impact Analysis:
	
	    • Correction to a function where the specification was :
	
	         o ambiguous or not sufficiently explicit.
	
	         o Would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise.
	
	Affected function: HCS measurement rules for intra- and inter-frequency cells

Consequences if not approved: ⌘	Ambiguous specification.
Clauses affected: ⌘	5.2.6.1.2

Other specs affected:	⌘	☐ Other core specifications	⌘	25.304 v4.1.0, CR 080
		☐ Test specifications		
		☐ O&M Specifications		
Other comments:	⌘			

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

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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.

5.2.6.1.2 Measurement rules for cell re-selection when HCS is used

If the system information broadcast in the serving cell indicates that HCS is used, then for intra-frequency and inter-frequency measurements, the UE shall:

1. For intra-frequency and inter-frequency threshold-based measurement rules

   use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

   IF ($Srxlev_s <= Ssearch_{HCS}$) or (if FDD and $S_x <= S_{intersearch}$) THEN

   measure on all intra-frequency and inter-frequency cells

   ELSE

   IF ($S_x > S_{intrasearch}$) THEN

   measure on all intra-frequency and inter-frequency cells, which have higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

   ELSE

   measure on all intra-frequency and inter-frequency cells, which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

   ENDIF

   ENDIF

   If HCS is used and if $S_{intrasearch}$ or $S_{searchHCS}$ or $S_{intersearch}$ (and in FDD) if $S_{intersearch}$ is are not sent for the serving cell, UE shall:, UE shall

   - measure on all intra-frequency and inter-frequency cells.

   If HCS is used and if $S_{intrasearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells.

2. For intra-frequency and inter-frequency measurement rules for fast-moving UEs:

   If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

   - measure intra-frequency and inter-frequency neighbouring cells, which have equal or lower HCS priority than serving cell.

   - prioritise re-selection of intra-frequency and inter-frequency neighbouring cells on lower HCS priority level before neighbouring cells on same HCS priority level.

   When the number of cell reselections during time period T_{CRmax} no longer exceeds N_{CR}, UE shall

   - continue these measurements during time period $T_{CrmaxHyst}$, and

   - revert to measurements according to the threshold based measurement rules.

When serving cell belongs to a hierarchical cell structure, the UE shall follow these rules for Inter-RAT measurements:

1. Inter-RAT threshold-based measurement rules

   use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

   IF ($Srxlev_s <= S_{HCS,RATm}$) or (if FDD and $S_{qual} <= S_{SearchRATm}$) THEN

   UE shall measure on all inter-RATm cells

   ELSE

   IF ($S_x > S_{limit,SearchRATm}$) THEN

UE need not measure neighbouring cells in RAT "m"

ELSE

UE shall measure on all neighbouring cells in RAT "m", which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

ENDIF

ENDIF

If HCS is used and if $S_{HCS,RATm}$ is not sent for the serving cell, UE shall measure on all inter-RATm cells.

2. Inter-RAT measurement rules for fast-moving UEs

- If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

  - measure the neighbouring cells in RAT "m", which have an equal or lower HCS priority than the serving cell

  - prioritise re-selection of neighbouring cells in RAT "m" on lower HCS priority level before neighbouring cells in RAT "m" on same HCS priority level.

  When the number of cell reselections during time interval T_{CRmax} no longer exceeds N_{CR}, UE shall

  - continue these measurements during time period $T_{CrmaxHyst}$, and

  - revert to measure according to the threshold-based measurement rules.

CR-Form-v4

CHANGE REQUEST

⌘ **25.304 CR 080** ⌘ ev **-** ⌘ Current version: **4.1.0** ⌘

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

Title: ⌘	Clarification to usage of measurement thresholds for HCS	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ 27 August 2001
Category: ⌘ **A**		***Release:*** ⌘ REL-4

Use <u>one</u> 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
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Use <u>one</u> of the following releases:
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  R96 (Release 1996)
  R97 (Release 1997)
  R98 (Release 1998)
  R99 (Release 1999)
  REL-4 (Release 4)
  REL-5 (Release 5)

Reason for change: ⌘	For measurement rules in HCS, it is currently specified that: "If HCS is used and if $S_{intersearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells." This is however only true for FDD cells, because Sintersearch is not used in HCS measurement rules for TDD. Furthermore, UE behaviour is clarified if optional information element $S_{SearchHCS}$ is not sent for the serving cell.
Summary of change: ⌘	- Clarification that Sintersearch is not used for TDD HCS measurement thresholds. - Clarification that UE shall measure on all intra- and inter-frequency cells if $S_{SearchHCS}$ is not sent for the serving cell.
Consequences if not approved: ⌘	Ambiguous specification.

Clauses affected: ⌘	5.2.6.1.2	
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications	25.304 v3.7.0, CR 079
Other comments: ⌘		

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5.2.6.1.2 Measurement rules for cell re-selection when HCS is used

If the system information broadcast in the serving cell indicates that HCS is used, then for intra-frequency and inter-frequency measurements, the UE shall:

1. For intra-frequency and inter-frequency threshold-based measurement rules

    use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

    IF ($Srxlev_s <= Ssearch_{HCS}$) or (if FDD and $S_x <= S_{intersearch}$) THEN

        measure on all intra-frequency and inter-frequency cells

    ELSE

        IF ($S_x > S_{intrasearch}$) THEN

            measure on all intra-frequency and inter-frequency cells, which have higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

        ELSE

            measure on all intra-frequency and inter-frequency cells, which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

        ENDIF

    ENDIF

    If HCS is used and if $S_{intrasearch}$ or $S_{searchHCS}$ or $S_{intersearch}$ (~~and~~ in FDD) ~~if $S_{intersearch}$ is~~ are not sent for the serving cell, UE shall:~~, UE shall~~

        -    measure on all intra-frequency and inter-frequency cells.

    ~~If HCS is used and if $S_{intrasearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells.~~

2. For intra-frequency and inter-frequency measurement rules for fast-moving UEs:

    If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

    - measure intra-frequency and inter-frequency neighbouring cells, which have equal or lower HCS priority than serving cell.

    - prioritise re-selection of intra-frequency and inter-frequency neighbouring cells on lower HCS priority level before neighbouring cells on same HCS priority level.

    When the number of cell reselections during time period T_{CRmax} no longer exceeds N_{CR}, UE shall

    - continue these measurements during time period $T_{CrmaxHyst}$, and

    - revert to measurements according to the threshold based measurement rules.

When serving cell belongs to a hierarchical cell structure, the UE shall follow these rules for Inter-RAT measurements:

1. Inter-RAT threshold-based measurement rules

    use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

    IF ($Srxlev_s <= S_{HCS,RATm}$) or (if FDD and $S_{qual} <= S_{SearchRATm}$) THEN

        UE shall measure on all inter-RATm cells

    ELSE

        IF ($S_x > S_{limit,SearchRATm}$) THEN

UE need not measure neighbouring cells in RAT "m"

ELSE

UE shall measure on all neighbouring cells in RAT "m", which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

ENDIF

ENDIF

If HCS is used and if $S_{HCS,RATm}$ is not sent for the serving cell, UE shall measure on all inter-RATm cells.

2. Inter-RAT measurement rules for fast-moving UEs

- If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

    - measure the neighbouring cells in RAT "m", which have an equal or lower HCS priority than the serving cell

    - prioritise re-selection of neighbouring cells in RAT "m" on lower HCS priority level before neighbouring cells in RAT "m" on same HCS priority level.

    When the number of cell reselections during time interval T_{CRmax} no longer exceeds N_{CR}, UE shall

    - continue these measurements during time period $T_{CrmaxHyst}$, and

    - revert to measure according to the threshold-based measurement rules.

CR-Form-v4

CHANGE REQUEST

⌘   **25.304** CR **081**   ⌘ ev **-** ⌘   Current version: **3.7.0** ⌘

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

Title:	⌘	Definition of strongest cell in cell search procedures		
Source:	⌘	TSG-RAN WG2		
Work item code:	⌘ TEI		***Date:*** ⌘	06/08/01

Category: ⌘ **F**	***Release:*** ⌘ R99

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  F (correction)
  A (corresponds to a correction in an earlier release)
  B (addition of feature),
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  D (editorial modification)
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  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 RAN2#22, following the receipt of liaison R2-011551from RAN1, it was agreed to add a broad definition for the term 'strongest cell' that is used in the cell search procedures. Furthermore, it was agreed to indicate that the precise details of the definition are left to implementation.
Summary of change:	⌘	1 - The following definition of strongest cell is added to the list of definitions in section 3.1:

    'Strongest cell: the cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure [14][15]. As the details of the layer 1 cell search are implementation dependent, the precise definition of 'strongest cell' is also implementation dependent.'

2 - The reference to layer 1 cell search procedures is removed from section 5.1.2.2

3 - Sentence added to section 5.2.3 to align cell selection with cell search for support of PLMN selection with regard to the new definition of strongest cell.

Isolated impact analysis:
Corrected functionality: Cell search for support of PLMN selection and for cell selection.

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

Consequences if ***not approved:***	⌘	The specification will remain insufficiently explicit.

Clauses affected:	⌘	3.1, 5.1.2.2, 5.2.3.1.1			
Other specs affected:	⌘	☐	Other core specifications	⌘	25.304 v4.1.0, CR 082
		☐	Test specifications		
		☐	O&M Specifications		
Other comments:	⌘				

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3　Definitions and abbreviations

3.1　Definitions

For the purposes of the present document, the following definitions and the definitions in [12] apply.

Acceptable Cell: a cell that satisfies certain conditions as specified in 4.3. A UE can always attempt emergency calls on an acceptable cell.

Available PLMN: a PLMN for which the UE has found at least one acceptable cell.

Barred Cell: A cell is barred if it is so indicated in the system information.

Camped on a cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

Camped on any cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

DRX cycle: individual time interval between monitoring Paging Occasion for a specific UE.

Equivalent PLMN: a PLMN considered as equivalent to the selected PLMN by the UE for PLMN selection, cell selection, cell reselection and handover according to the information provided by the NAS.

Home PLMN: a PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

Location Registration (LR): UE registers its presence in a registration area, for instance regularly or when entering a new registration area.

Maximum DRX cycle: time interval for the longest possible DRX cycle in a cell.

Paging Block Periodicity (PBP): period of the occurrence of Paging Blocks. (For FDD, PBP = 1).

Paging Message Receiving Occasion (TDD only)**:** the frame where the UE receives actual paging message.

Paging occasion:
(FDD) The SFN of the PICH frame where the UE monitors its paging indicator (i.e. the SFN of the PCCPCH frame in which the PICH frame begins).
(TDD) The paging block, which consists of several frames. The value of Paging Occasion is equal to the first frame of the Paging Block.

Process: a local action in the UE invoked by a RRC procedure or an Idle Mode procedure.

Radio Access Mode: radio access mode of the cell, FDD or TDD.

Radio Access Technology: type of technology used for radio access, for instance UTRA or GSM.

Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Selected PLMN: this is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: the cell on which the UE is camped.

Strongest cell: the cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure [14][15]. As the details of the layer 1 cell search are implementation dependent, the precise definition of 'strongest cell' is also implementation dependent.

Suitable Cell: This is a cell on which an UE may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP [1] and for Iu mode in section 4.3.

## 5.1.2	Support for PLMN Selection

### 5.1.2.1	General

On request of the NAS the AS should perform a search for available PLMNs and report them to NAS.

### 5.1.2.2	UTRA case

The UE shall scan all RF channels in the UTRA bands according to its capabilities to find available PLMNs. On each carrier, the UE shall search for the strongest cell ~~according to the cell search procedures (for FDD, see [14], and TDD, see [15])~~ and read its system information, in order to find out which PLMN the cell belongs to. If the UE can read the PLMN identity, the found PLMN shall be reported to the NAS as a high quality PLMN (but without the RSCP value), provided that the following high quality criterion is fulfilled:

1.	For an FDD cell, the measured primary CPICH RSCP value shall be greater than or equal to -95 dBm.

2.	For a TDD cell, the measured P-CCPCH RSCP shall be greater than or equal to -84 dBm.

Found PLMNs that do not satisfy the high quality criterion, but for which the UE has been able to read the PLMN identities are reported to the NAS together with the CPICH RSCP value for UTRA FDD cells and P-CCPCH RSCP for UTRA TDD cells.

The search for PLMNs on the rest of the carriers may be stopped on request of the NAS. The UE may optimise this search by using stored information of carrier frequencies and optionally also information on cell parameters, e.g. scrambling codes, from previously received measurement control information elements.

Once the UE has selected a PLMN, the cell selection procedure shall be performed in order to select a suitable cell of that PLMN to camp on.

### 5.1.2.3	GSM case

Support for network selection in GSM is described in [1].

5.2.3   Cell Selection Process

5.2.3.1   UTRA case

5.2.3.1.1   Description

The UE shall use one of the following two search procedures:

a) Initial Cell Selection

This procedure requires no prior knowledge of which RF channels are UTRA carriers. The UE shall scan all RF channels in the UTRA bands according to its capabilities to find a suitable cell of the selected PLMN. On each carrier, the UE need only search for the strongest cell. Once a suitable cell is found this cell shall be selected.

b) Stored Information Cell Selection

This procedure requires stored information of carrier frequencies and optionally also information on cell parameters, e.g. scrambling codes, from previously received measurement control information elements. Once the UE has found a suitable cell for the selected PLMN the UE shall select it. If no suitable cell of the selected PLMN is found the Initial cell selection procedure shall be started.

CR-Form-v4

CHANGE REQUEST

⌘   **25.304** CR **082**   ⌘ ev **-** ⌘ Current version: **4.1.0** ⌘

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

Title: ⌘	Definition of strongest cell in cell search procedures	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ 06/08/01

Category: ⌘ **A**	***Release:*** ⌘ REL-4

Use <u>one</u> of the following categories:
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  REL-4 *(Release 4)*
  REL-5 *(Release 5)*

Reason for change: ⌘	At RAN2#22, following the receipt of liaison R2-011551from RAN1, it was agreed to add a broad definition for the term 'strongest cell' that is used in the cell search procedures. Furthermore, it was agreed to indicate that the precise details of the definition are left to implementation.
Summary of change: ⌘	1 - The following definition of strongest cell is added to the list of definitions in section 3.1: '**Strongest cell:** the cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure [14][15]. As the details of the layer 1 cell search are implementation dependent, the precise definition of 'strongest cell' is also implementation dependent.' 2 - The reference to layer 1 cell search procedures is removed from section 5.1.2.2 3 - Sentence added to section 5.2.3 to align cell selection with cell search for support of PLMN selection with regard to the new definition of strongest cell. **Isolated impact analysis:** Corrected functionality: Cell search for support of PLMN selection and for cell selection. Correction to a function where the specification was not sufficiently explicit. Would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise.
Consequences if not approved: ⌘	The specification will remain insufficiently explicit.

Clauses affected:	⌘	3.1, 5.1.2.2, 5.2.3.1.1			
Other specs affected:	⌘	☐	Other core specifications	⌘	25.304 v3.7.0, CR 081
		☐	Test specifications		
		☐	O&M Specifications		
Other comments:	⌘				

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3   Definitions and abbreviations

3.1   Definitions

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Camped on any cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

DRX cycle: individual time interval between monitoring Paging Occasion for a specific UE.

Equivalent PLMN: a PLMN considered as equivalent to the selected PLMN by the UE for PLMN selection, cell selection, cell reselection and handover according to the information provided by the NAS.

Home PLMN: a PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

Location Registration (LR): UE registers its presence in a registration area, for instance regularly or when entering a new registration area.

Maximum DRX cycle: time interval for the longest possible DRX cycle in a cell.

Paging Block Periodicity (PBP): period of the occurrence of Paging Blocks. (For FDD, PBP = 1).

Paging Message Receiving Occasion (TDD only)**:** the frame where the UE receives actual paging message.

Paging occasion:
(FDD) The SFN of the PICH frame where the UE monitors its paging indicator (i.e. the SFN of the PCCPCH frame in which the PICH frame begins).
(TDD) The paging block, which consists of several frames. The value of Paging Occasion is equal to the first frame of the Paging Block.

Process: a local action in the UE invoked by a RRC procedure or an Idle Mode procedure.

Radio Access Mode: radio access mode of the cell, FDD or TDD.

Radio Access Technology: type of technology used for radio access, for instance UTRA or GSM.

Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Selected PLMN: this is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: the cell on which the UE is camped.

Strongest cell: the cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure [14][15]. As the details of the layer 1 cell search are implementation dependent, the precise definition of 'strongest cell' is also implementation dependent.

Suitable Cell: This is a cell on which an UE may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP [1] and for Iu mode in section 4.3.

5.1.2 Support for PLMN Selection

5.1.2.1 General

On request of the NAS the AS should perform a search for available PLMNs and report them to NAS.

5.1.2.2 UTRA case

The UE shall scan all RF channels in the UTRA bands according to its capabilities to find available PLMNs. On each carrier, the UE shall search for the strongest cell ~~according to the cell search procedures (for FDD, see [14], and TDD, see [15])~~ and read its system information, in order to find out which PLMN the cell belongs to. If the UE can read the PLMN identity, the found PLMN shall be reported to the NAS as a high quality PLMN (but without the RSCP value), provided that the following high quality criterion is fulfilled:

1. For an FDD cell, the measured primary CPICH RSCP value shall be greater than or equal to -95 dBm.

2. For a TDD cell, the measured P-CCPCH RSCP shall be greater than or equal to -84 dBm.

Found PLMNs that do not satisfy the high quality criterion, but for which the UE has been able to read the PLMN identities are reported to the NAS together with the CPICH RSCP value for UTRA FDD cells and P-CCPCH RSCP for UTRA TDD cells.

The search for PLMNs on the rest of the carriers may be stopped on request of the NAS. The UE may optimise this search by using stored information of carrier frequencies and optionally also information on cell parameters, e.g. scrambling codes, from previously received measurement control information elements.

Once the UE has selected a PLMN, the cell selection procedure shall be performed in order to select a suitable cell of that PLMN to camp on.

5.1.2.3 GSM case

Support for network selection in GSM is described in [1].

5.2.3 Cell Selection Process

5.2.3.1 UTRA case

5.2.3.1.1 Description

The UE shall use one of the following two search procedures:

a) Initial Cell Selection

This procedure requires no prior knowledge of which RF channels are UTRA carriers. The UE shall scan all RF channels in the UTRA bands according to its capabilities to find a suitable cell of the selected PLMN. On each carrier, the UE need only search for the strongest cell. Once a suitable cell is found this cell shall be selected.

b) Stored Information Cell Selection

This procedure requires stored information of carrier frequencies and optionally also information on cell parameters, e.g. scrambling codes, from previously received measurement control information elements. Once the UE has found a suitable cell for the selected PLMN the UE shall select it. If no suitable cell of the selected PLMN is found the Initial cell selection procedure shall be started.

CR-Form-v4

CHANGE REQUEST

⌘ **25.304** CR **083** ⌘ ev **r1** ⌘ Current version: **3.7.0** ⌘

*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: ⌘	Miscellaneous corrections	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ 10/08/2001

Category: ⌘ **F**	***Release:*** ⌘ R99

Use <u>one</u> 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 <u>one</u> 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: ⌘	1 - Section 5.2.1 contains a reference to mapping functions that should have been removed when mapping functions where removed. 2 - Section 5.2.6.1.4 - this section defines the cell selection criteria in one place as the H and R criteria and in another place as the S criteria (the later text being added in the v3.7.0). The final sentence refers to 'cell reselection criteria' which is now ambiguous - it could be read as referring to the H and R criteria or the S criteria. 3 - 25.133 specifies a requirement that the UE shall not reselect to a cell if less than 1s has elapsed since the UE has started to camp on the current serving cell. This is a core requirement rather than a performance requirements and should be captured in 25.304. 4 - Section 5.3.1.1 list the possible types of cell access restriction but misses out the 3rd type of restriction 'Cell Reservation for future use' 5 - Section 5.4.1 describes the Initial Cell Reselection Process and states that the triggers for Initial Cell Re-Selection are defined in 25.331. However, the only reference in 25.331 to Initial Cell Reselection is in the informative annex and the normative sections of 25.331 specify that the 'UE shall select a suitable UTRA cell according to [25.304]'. Therefore the Initial Cell Reselection Process is never triggered in 25.331. 6 - Section 10.5 - editorial error - unnecessary 'and'. 7 - The definition of 'suitable cell' in section 3 uses potentially unclear references to A/Gb mode and Iu mode. References to these modes are not used elsewhere in this spec or other RAN specs. 8 - The general description of access stratum functions in idle mode incorrectly

		mentions PLMN selection and handover.
		9 - Section 4.3 lists cell categories including barred cell, but does not mention 'reserved cell'.
		10 - Incorrect indent in section 5.2.6.1.2
Summary of change: ⌘		1 - Reference to mapping function in 5.2.1 removed.
		2 - The use of the term 'cell reselection criteria' is clarified and the final sentence of section 5.2.6.1.4 is reworded to be more explicit about what is being referred to as the cell reselection criteria.
		3 - The requirement that a UE shall not reselect to a cell if less than 1s has elapsed since the UE has started to camp on the current serving cell is added to section 5.2.6.1.24.
		4 - 'Cell reserved for future use' added to list of possible restrictions in 5.3.3.1
		5 - Sections 5.4.1 and 5.4.1.1 referring to the 'initial cell reselection process' which is never triggered within 25.331 are removed.
		6 - Unnecessary 'and' removed
		7 - References to A/Gb mode and Iu mode changes to UTRA cell and GSM cell.
		8 - References to PLMN selection and handover removed from section 4.1
		9 - Reserved cell added to the list of cell categories
		10 - Indentation correction in section 5.2.6.1.2
		Isolated impact analysis: Corrected functionality: Cell selection and reselection
		Correction to a function where the specification was ambiguous or not sufficiently explicit. Would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise.
Consequences if not approved:	⌘	The specification will remain ambiguous or insufficiently explicit.

Clauses affected:	⌘	3.1, 4.1, 4.3, 5.2.1, 5.2.6.1.2, 5.2.6.1.4, 5.3.1.1, 5.4.1, 10.5		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.304 v4.1.0, CR 084
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. ⌘

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions and the definitions in [12] apply.

Acceptable Cell: a cell that satisfies certain conditions as specified in 4.3. A UE can always attempt emergency calls on an acceptable cell.

Available PLMN: a PLMN for which the UE has found at least one acceptable cell.

Barred Cell: A cell is barred if it is so indicated in the system information.

Camped on a cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

Camped on any cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

DRX cycle: individual time interval between monitoring Paging Occasion for a specific UE.

Equivalent PLMN: a PLMN considered as equivalent to the selected PLMN by the UE for PLMN selection, cell selection, cell reselection and handover according to the information provided by the NAS.

Home PLMN: a PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

Location Registration (LR): UE registers its presence in a registration area, for instance regularly or when entering a new registration area.

Maximum DRX cycle: time interval for the longest possible DRX cycle in a cell.

Paging Block Periodicity (PBP): period of the occurrence of Paging Blocks. (For FDD, PBP = 1).

Paging Message Receiving Occasion (TDD only)**:** the frame where the UE receives actual paging message.

Paging occasion:
(FDD) The SFN of the PICH frame where the UE monitors its paging indicator (i.e. the SFN of the PCCPCH frame in which the PICH frame begins).
(TDD) The paging block, which consists of several frames. The value of Paging Occasion is equal to the first frame of the Paging Block.

Process: a local action in the UE invoked by a RRC procedure or an Idle Mode procedure.

Radio Access Mode: radio access mode of the cell, FDD or TDD.

Radio Access Technology: type of technology used for radio access, for instance UTRA or GSM.

Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Selected PLMN: this is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: the cell on which the UE is camped.

Suitable Cell: This is a cell on which an UE may camp. For a UTRA cell, the criteria are defined in section 4.3, and for a GSM cell the criteria are defined in [1]. It must satisfy criteria which is defined for A/Gb mode in 3GPP [1] and for Iu mode in section 4.3.

4   General description of Idle mode

4.1   Overview

When a UE is switched on, a public land mobile network (PLMN) is selected and the UE searches for a suitable cell of this PLMN to camp on. Criteria for cell selection and cell re-selection between radio access technologies (RATs) described in this document only consider radio criteria. In addition to RAT, the PLMN type may differ as well. In this specification, the term PLMN is used as a generic term covering both GSM MAP and ANSI-41 type of PLMNs. According to the type of PLMN, the way to identify it can be different. If the PLMN type is GSM, the PLMN is identified by 'PLMN identity' and if the PLMN type is ANSI-41, the PLMN is identified by 'SID'

The NAS shall provide a list of equivalent PLMNs, if available, that the AS shall use for ~~PLMN selection,~~ cell selection<u>, and</u> cell reselection ~~and handover~~.

The UE searches for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel. This choosing is known as "camping on the cell". The UE will, if necessary, then register its presence, by means of a NAS registration procedure, in the registration area of the chosen cell.

If the UE finds a more suitable cell, it reselects onto that cell and camps on it. If the new cell is in a different registration area, location registration is performed.

If necessary, the UE will look for more suitable cells on other PLMNs at regular time intervals, which is referred to as PLMN-reselection. This is described in [9].

If the UE loses coverage of the registered PLMN, either a new PLMN is selected automatically (automatic mode), or an indication of which PLMNs are available is given to the user, so that a manual selection can be made (manual mode).

Registration is not performed by UEs only capable of services that need no registration.

The purpose of camping on a cell in idle mode is fourfold:

   a) It enables the UE to receive system information from the PLMN.

   b) When registered and if the UE wishes to establish an RRC connection, it can do this by initially accessing the network on the control channel of the cell on which it is camped.

   c) If the PLMN receives a call for the registered UE, it knows (in most cases) the registration area of the cell in which the UE is camped. It can then send a "paging" message for the UE on control channels of all the cells in the registration area. The UE will then receive the paging message because it is tuned to the control channel of a cell in that registration area and the UE can respond on that control channel.

   d) It enables the UE to receive cell broadcast services.

If the UE is unable to find a suitable cell to camp on, or the USIM is not inserted, or if the location registration failed (except for LR rejected with cause #14 or cause #15, see [5] and [16]), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls.

The idle mode tasks can be subdivided into three processes:

   - PLMN selection and reselection;

   - Cell selection and reselection;

   - Location registration.

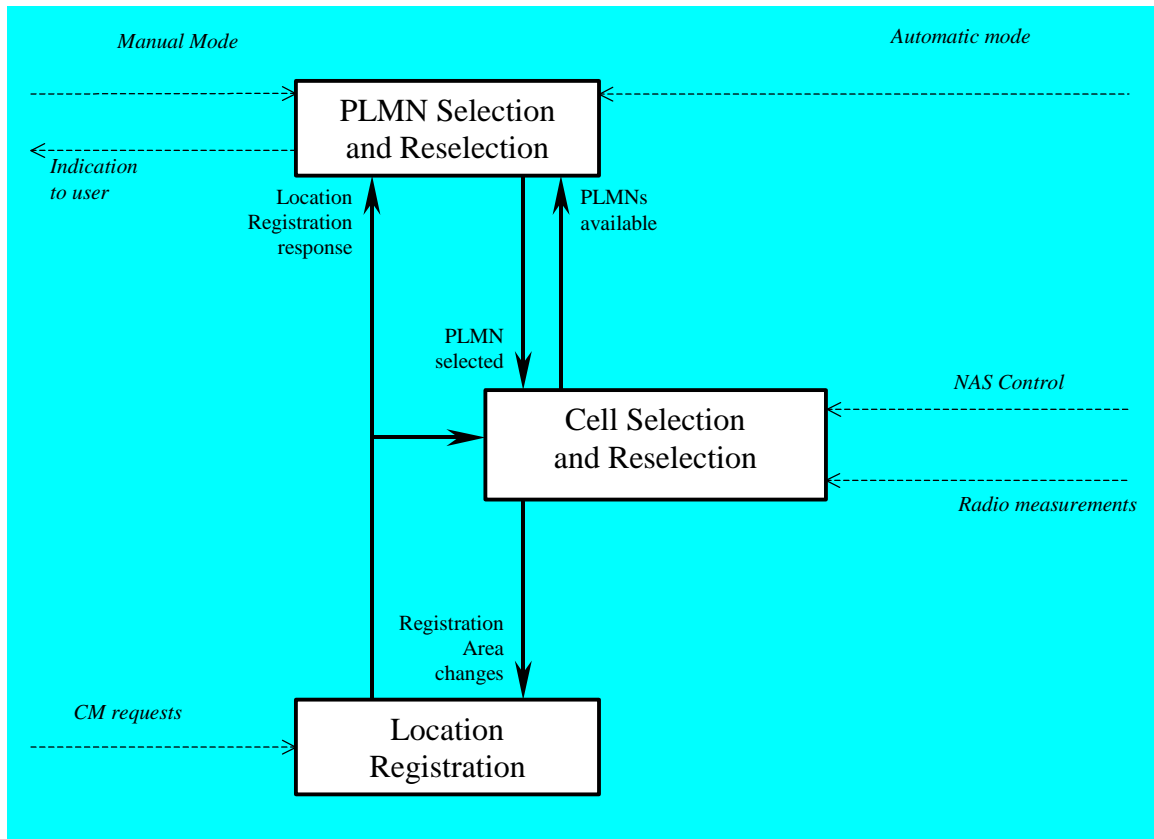The relationship between these processes is illustrated in Figure 1.

Figure 1: Overall Idle Mode process

# 4.3	Service type in Idle mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode.

The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE in idle mode:

-	Limited service (emergency calls on an acceptable cell)

-	Normal service (for public use on a suitable cell)

-	Operator service (for operators only on a reserved cell)

Furthermore, the cells are categorised according to which services they offer:

acceptable cell:

An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls). Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call in a UTRAN network:

-	The cell is not barred, see subclause 5.3.4.1

-	The cell selection criteria are fulfilled, see subclause 5.2.3.1.2;

suitable cell:

A "suitable cell" is a cell on which the UE may camp on to obtain normal service. Such a cell shall fulfil all the following requirements.

-	The cell is part of the selected PLMN or, of a PLMN considered as equivalent by the UE according to the information provided by the NAS.

-	The cell is not barred, see subclause 5.3.4.1.

-	The cell is not part of the list of "forbidden LAs for roaming" [9]

-	The cell selection criteria are fulfilled, see subclause 5.2.3.1.2.

barred cell:

A cell is barred if it is so indicated in the system information [4].

reserved cell:

A cell is reserved if it is so indicated in system information [4].

5.2 Cell selection and reselection in idle mode

5.2.1 Introduction

As stated in clause 1, the present document applies to UEs that support at least UTRA.

Different types of measurements are used in different RATs and modes for the cell selection and reselection. ~~Whenever a direct comparison of these measurements is required, mapping functions will be applied that are defined in [4].~~ The performance requirements for the measurements are specified in [10] and [11].

The NAS can control the RAT(s) in which the cell selection should be performed, for instance by indicating RAT(s) associated with the selected PLMN, and by maintaining a list of forbidden registration area(s) and a list of equivalent PLMNs. The UE shall select a suitable cell and the radio access mode based on idle mode measurements and cell selection criteria.

In order to speed up the cell selection process, stored information for several RATs may be available in the UE.

When camped on a cell, the UE shall regularly search for a better cell according to the cell reselection criteria. If a better cell is found, that cell is selected. The change of cell may imply a change of RAT. Details on performance requirements for cell reselection can be found in [10] and [11].

The NAS is informed if the cell selection and reselection results in changes in the received system information.

For normal service, the UE has to camp on a suitable cell, tune to that cell's control channel(s) so that the UE can:

- Receive system information from the PLMN;

    - Receive registration area information from the PLMN, e.g., location area and routing area; and

    - Receive other AS and NAS Information;

- If registered:

    - receive paging and notification messages from the PLMN; and

    - initiate call setup for outgoing calls or other actions from the UE.

5.2.6.1.2 Measurement rules for cell re-selection when HCS is used

If the system information broadcast in the serving cell indicates that HCS is used, then for intra-frequency and inter-frequency measurements, the UE shall:

1. For intra-frequency and inter-frequency threshold-based measurement rules

    use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

    IF ($Srxlev_s <= Ssearch_{HCS}$) or (if FDD and $S_x <= S_{intersearch}$) THEN

        measure on all intra-frequency and inter-frequency cells

    ELSE

        IF ($S_x > S_{intrasearch}$) THEN

            measure on all intra-frequency and inter-frequency cells, which have higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

        ELSE

            measure on all intra-frequency and inter-frequency cells, which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

        ENDIF

    ENDIF

    If HCS is used and if $S_{intersearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells.

    If HCS is used and if $S_{intrasearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells.

2. For intra-frequency and inter-frequency measurement rules for fast-moving UEs: [Hans: Incorrect indent. Style changed from B1 to normal]

    If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

    - measure intra-frequency and inter-frequency neighbouring cells, which have equal or lower HCS priority than serving cell.

    - prioritise re-selection of intra-frequency and inter-frequency neighbouring cells on lower HCS priority level before neighbouring cells on same HCS priority level.

    When the number of cell reselections during time period T_{CRmax} no longer exceeds N_{CR}, UE shall

    - continue these measurements during time period $T_{CrmaxHyst}$, and

    - revert to measurements according to the threshold based measurement rules.

When serving cell belongs to a hierarchical cell structure, the UE shall follow these rules for Inter-RAT measurements:

1. Inter-RAT threshold-based measurement rules

    use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

    IF ($Srxlev_s <= S_{HCS,RATm}$) or (if FDD and $S_{qual} <= S_{SearchRATm}$) THEN

        UE shall measure on all inter-RATm cells

    ELSE

        IF ($S_x > S_{limit,SearchRATm}$) THEN

UE need not measure neighbouring cells in RAT "m"

ELSE

UE shall measure on all neighbouring cells in RAT "m", which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

ENDIF

ENDIF

If HCS is used and if $S_{HCS,RATm}$ is not sent for the serving cell, UE shall measure on all inter-RATm cells.

2. Inter-RAT measurement rules for fast-moving UEs

- If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

  - measure the neighbouring cells in RAT "m", which have an equal or lower HCS priority than the serving cell

  - prioritise re-selection of neighbouring cells in RAT "m" on lower HCS priority level before neighbouring cells in RAT "m" on same HCS priority level.

  When the number of cell reselections during time interval T_{CRmax} no longer exceeds N_{CR}, UE shall

  - continue these measurements during time period $T_{CrmaxHyst}$, and

  - revert to measure according to the threshold-based measurement rules.

5.2.6.1.4 Cell Reselection Criteria

The following cell re-selection criteria are used for intra-frequency cells, inter-frequency cells and inter-RAT cells:

The quality level threshold criterion H for hierarchical cell structures is used to determine whether prioritised ranking according to hierarchical cell re-selection rules shall apply, and is defined by:

$$H_s = Q_{meas,s} - Qhcs_s$$

$$H_n = Q_{meas,n} - Qhcs_n - TO_n * L_n$$

If it is indicated in system information that HCS is not used, the quality level threshold criterion H is not applied.

The cell-ranking criterion R is defined by:

$$R_s = Q_{meas,s} + Qhyst_s$$

$$R_n = Q_{meas,n} - Qoffset_{s,n} - TO_n * (1 - L_n)$$

where:

$$TO_n = TEMP\_OFFSET_n * W(PENALTY\_TIME_n - T_n)$$

$$L_n = 0 \quad\quad\quad\quad \text{if } HCS\_PRIO_n = HCS\_PRIO_s$$
$$L_n = 1 \quad\quad\quad\quad \text{if } HCS\_PRIO_n <> HCS\_PRIO_s$$

$$W(x) = 0 \quad\quad\quad \text{for } x < 0$$
$$W(x) = 1 \quad\quad\quad \text{for } x >= 0$$

$TEMP\_OFFSET_n$ applies an offset to the H and R criteria for the duration of $PENALTY\_TIME_n$ after a timer T_n has started for that neighbouring cell.

$TEMP\_OFFSET_n$ and $PENALTY\_TIME_n$ are only applicable if the usage of HCS is indicated in system information.

The timer T_n is implemented for each neighbouring cell. T_n shall be started from zero when one of the following conditions becomes true:

- if $HCS\_PRIO_n <> HCS\_PRIO_s$ and

$$Q_{meas,n} > Qhcs_n$$

Or

- if $HCS\_PRIO_n = HCS\_PRIO_s$ and

  - for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH RSCP in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

  - for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Qoffset2_{s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

T_n for the associated neighbour cell shall be stopped as soon as any of the above conditions are no longer fulfilled. Any value calculated for TO_n is valid only if the associated timer T_n is still running else TO_n shall be set to zero.

At cell-reselection, a timer T_n is stopped only if the corresponding cell is not a neighbour cell of the new serving cell, or if the criteria given above for starting timer T_n for the corresponding cell is no longer fulfilled with the parameters of the new serving cell. On cell re-selection, timer T_n shall be continued to be run for the corresponding cells but the criteria given above shall be evaluated with parameters broadcast in the new serving cell if the corresponding cells are neighbours of the new serving cell.

S_n	Cell Selection value of the neighbouring cell, (dB)
Q_{meas}	Quality value. The quality value of the received signal derived from the averaged CPICH Ec/No or CPICH RSCP for FDD cells, from the averaged P-CCPCH RSCP for TDD cells and from the averaged received signal level for GSM cells. The averaging of these measurement quantities are performed as specified in [10] and [11]. For FDD cells, the measurement that is used to derive the quality value is set by the Cell_selection_and_reselection_quality_measure information element.

Cell reselection parameters broadcast in system information are listed in subclause 5.2.6.1.5.

The cell selection criterion S used for cell reselection criterion S is fulfilled when:

for FDD cells: $Srxlev > 0$ AND $Squal > 0$

for TDD cells: $Srxlev > 0$

for GSM cells: $Srxlev > 0$

Where :

$$Squal = Q_{qualmeas} - Qqualmin$$

$$Srxlev = Q_{rxlevmeas} - Qrxlevmin - Pcompensation$$

Squal	Cell Selection quality value (dB) Applicable only for FDD cells.
Srxlev	Cell Selection RX level value (dB)
$Q_{qualmeas}$	Measured cell quality value. The quality of the received signal expressed in CPICH E_C/N_0 (dB) for FDD cells. CPICH Ec/N0 shall be averaged as specified in [10]. Applicable only for FDD cells.
$Q_{rxlevmeas}$	Measured cell RX level value. This is received signal, CPICH RSCP for FDD cells (dBm), P-CCPCH RSCP for TDD cells (dBm) and the averaged received signal level as specified in [10] for GSM cells (dBm). CPICH RSCP, P-CCPCH RSCP and the received signal level for GSM cells shall be averaged as specified in [10] and [11].
Qqualmin	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Qrxlevmin	Minimum required RX level in the cell (dBm)
Pcompensation	max(UE_TXPWR_MAX_RACH – P_MAX, 0) (dB)
UE_TXPWR_MAX_RACH	Maximum TX power level an UE may use when accessing the cell on RACH (read in system information) (dBm)
P_MAX	Maximum RF output power of the UE (dBm)

The UE shall perform ranking of all cells that fulfil the S criterion among

- all cells that have the highest HCS_PRIO among those cells that fulfil the criterion H >= 0. Note that this rule is not valid when UE high-mobility is detected (see subclause 5.2.6.1.2).

- all cells, not considering HCS priority levels, if no cell fulfil the criterion H >= 0. This case is also valid when it is indicated in system information that HCS is not used, that is when serving cell does not belong to a hierarchical cell structure.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using CPICH RSCP, P-CCPCH RSCP and the averaged received signal level as specified in [10] and [11] for FDD, TDD and GSM cells, respectively.

The offset $Qoffset1_{s,n}$ is used for $Qoffset_{s,n}$ to calculate R_n, the hysteresis $Qhyst1_s$ is used for $Qhyst_s$ to calculate R_s.

If the usage of HCS is indicated in system information, $TEMP\_OFFSET1_n$ is used for $TEMP\_OFFSET_n$ to calculate TO_n. If it is indicated in system information that HCS is not used, $TEMP\_OFFSET_n$ is not applied when calculating R_n. The best ranked cell is the cell with the highest R value.

If a TDD or GSM cell is ranked as the best cell, then the UE shall perform cell re-selection to that TDD or GSM cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH RSCP, the UE shall perform cell re-selection to that FDD cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH Ec/No, the UE shall perform a second ranking of the FDD cells according to the R criteria specified above, but using the measurement quantity CPICH Ec/No for deriving the $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values of the FDD cells. The offset $Qoffset2_{s,n}$ is used for $Qoffset_{s,n}$ to calculate R_n, the hysteresis $Qhyst2_s$ is used for $Qhyst_s$ to calculate R_s. If the usage of HCS is indicated in system information, $TEMP\_OFFSET2_n$ is used to calculate TO_n. If it is indicated in system information that HCS is not used, $TEMP\_OFFSET_n$ is not applied when calculating R_n. Following this second ranking, the UE shall perform cell re-selection to the best ranked FDD cell.

In all cases, the UE shall reselect the new cell, only if the following conditions are met ~~cell reselection criteria are fulfilled during a time interval Treselection:~~.

- the new cell is better ranked than the serving cell during a time interval Treselection.

- more than 1 second has elapsed since the UE camped on the current serving cell.

5.3 Cell Access Restrictions

5.3.1 UTRA cells

There are two mechanisms which allow an operator to impose cell access restrictions. The first mechanism uses indication of cell status and special reservations for control of cell selection and re-selection procedures. The second mechanism, referred to as Access Control, shall allow to prevent selected classes of users from sending initial access messages for load control reasons. At subscription, one or more Access Classes are allocated to the subscriber and stored in the USIM [9], which are employed for this purpose.

5.3.1.1 Cell status and cell reservations

Cell status and cell reservations are indicated with the *Cell Access Restriction* Information Element in the System Information Message [4] by means of three Information Elements:

- Cell barred (IE type: "barred" or "not barred"),

- Cell Reserved for operator use (IE type: "reserved" or "not reserved"),

- Cell reserved for future extension (IE type: " reserved" or "not reserved")

When cell status is indicated as "not barred", "not reserved" for operator use and "not reserved" for future extension (Cell Reservation Extension),

- the UE may select/re-select this cell during the cell selection and cell re-selection procedures in Idle mode and in Connected mode.

When cell status is indicated as "not barred", "not reserved" for operator use and "reserved" for future extension (Cell Reservation Extension),

- UEs shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status is indicated as "not barred" and "reserved" for operator use,

- UEs assigned to an Access Class in the range 11 to 15 may select/re-select this cell if in the home PLMN.

- UEs assigned to an Access Class in the range 0 to 9 shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status "barred" is indicated,

- The UE is not permitted to select/re-select this cell, not even for emergency calls.

- The UE shall ignore the "Cell Reserved for future extension (Cell Reservation Extension) use" IE.

- The UE shall select another cell according to the following rule:

  - If the "Intra-frequency cell re-selection indicator" IE in Cell Access Restriction IE is set to value "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.

    - If the UE is camping on another cell, the UE shall exclude the barred cell from the neighbouring cell list until the expiry of a time interval T_{barred}. The time interval T_{barred} is sent via system information in a barred cell together with Cell status information in the Cell Access Restriction IE.

    - If the UE does not select another cell, and the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

  - If the "Intra-frequency cell re-selection indicator" IE is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell. For emergency call, the Intra-frequency cell re-selection indicator IE" shall be ignored, i.e. even if it is set to "not allowed" the UE may select another intra-frequency cell.

- If the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

5.3.1.2 Access Control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [4].

The UE shall ignore Access Class related cell access restrictions when selecting a cell to camp on, i.e. it shall not reject a cell for camping on because access on that cell is not allowed for any of the Access Classes of the UE. A change of the indicated access restriction shall not trigger cell re-selection by the UE.

Access Class related cell access restrictions shall be checked by the UE before sending an RRC CONNECTION REQUEST message when entering Connected Mode from UTRAN Idle mode. Cell access restrictions associated with the Access Classes shall not apply when the initial access for entering Connected Mode is triggered by an Inter-RAT cell re-selection to UTRAN, and for a UE which already is in Connected Mode.

5.3.1.3 Emergency Call

Emergency calls shall be allowed in all cells whose barred status is not barred, independent of restrictions due to cell reservations.

A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [4]. Full details of operation under "Access class barred list" are described in [9].

5.3.2 GSM cells

The cell access restrictions applicable to GSM are specified in [1].

5.4 Cell Reselection Processes in RRC Connected Mode

5.4.1 VoidInitial Cell Reselection Process

Triggers for the Initial cell re-selection process are specified in [4].

The UE shall attempt to find a suitable cell belonging to the selected PLMN and select it.

If the UE is unable to find any suitable cell, the UE shall release the RRC connection and enter idle mode.

5.4.1.1 Criteria

The criteria for initial cell reselection are specified in subclause 5.2.6.1.4.

5.4.2 Void

5.4.3 Cell Reselection Process

The *cell reselection* process in Connected Mode is the same as *cell reselection evaluation process* used for idle mode, described in subclause 5.2.6.

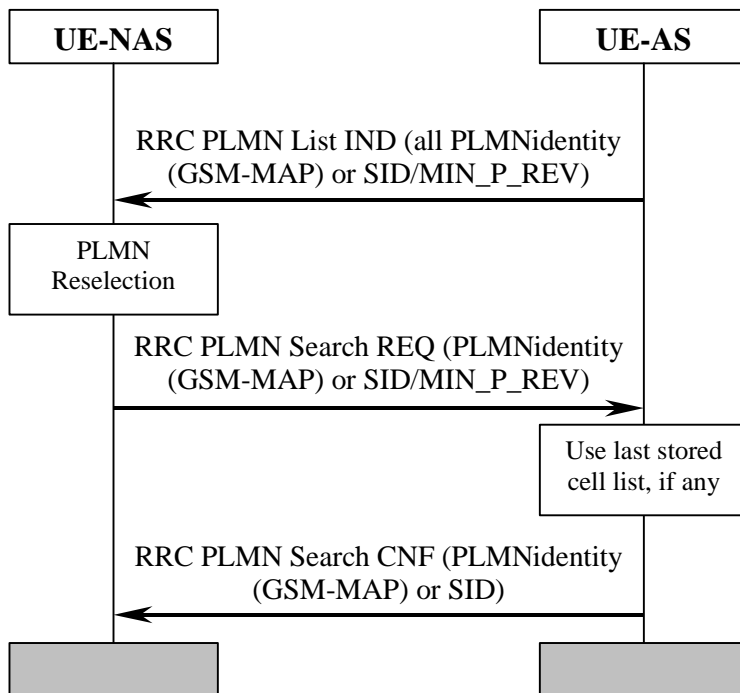## 10.5 PLMN Reselection, automatic mode

Figure 9: PLMN Reselection, automatic mode

Triggered by, for instance, a timer in NAS, AS is requested to send a list to NAS with all PLMNs currently available. The list includes the identities of available PLMNs and. Assuming that a PLMN with higher priority is found, NAS requests AS to select a suitable cell belonging to the PLMN with highest priority. When searching for the requested PLMN and in order to speed up the search, AS may use a list of cell information previously stored. When a suitable cell

CR-Form-v4

CHANGE REQUEST

⌘   **25.304** CR **084**   ⌘ ev **-** ⌘ Current version: **4.1.0** ⌘

*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: ⌘	Miscellaneous corrections
Source: ⌘	TSG-RAN WG2
Work item code: ⌘ TEI	***Date:*** ⌘ 10/08/2001
Category: ⌘ **A**	***Release:*** ⌘ REL-4

Use <u>one</u> 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 <u>one</u> 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: ⌘	1 - Section 5.2.1 contains a reference to mapping functions that should have been removed when mapping functions where removed.

2 - Section 5.2.6.1.4 - this section defines the cell selection criteria in one place as the H and R criteria and in another place as the S criteria (the later text being added in the v3.7.0). The final sentence refers to 'cell reselection criteria' which is now ambiguous - it could be read as referring to the H and R criteria or the S criteria.

3 - 25.133 specifies a requirement that the UE shall not reselect to a cell if less than 1s has elapsed since the UE has started to camp on the current serving cell. This is a core requirement rather than a performance requirements and should be captured in 25.304.

4 - Section 5.3.1.1 list the possible types of cell access restriction but misses out the 3rd type of restriction 'Cell Reservation for future use'

5 - Section 5.4.1 describes the Initial Cell Reselection Process and states that the triggers for Initial Cell Re-Selection are defined in 25.331. However, the only reference in 25.331 to Initial Cell Reselection is in the informative annex and the normative sections of 25.331 specify that the 'UE shall select a suitable UTRA cell according to [25.304]'. Therefore the Initial Cell Reselection Process is never triggered in 25.331.

6 - Section 10.5 - editorial error - unnecessary 'and'.

7 - The definition of 'suitable cell' in section 3 uses potentially unclear references to A/Gb mode and Iu mode. References to these modes are not used elsewhere in this spec or other RAN specs.

8 - The general description of access stratum functions in idle mode incorrectly |

<table>
<tr>
<td></td>
<td colspan="2">mentions PLMN selection and handover.

9 - Section 4.3 lists cell categories including barred cell, but does not mention 'reserved cell'.

10 - Incorrect indent in section 5.2.6.1.2</td>
</tr>
<tr>
<td>*Summary of change:* ⌘</td>
<td colspan="2">1 - Reference to mapping function in 5.2.1 removed.

2 - The use of the term 'cell reselection criteria' is clarified and the final sentence of section 5.2.6.1.4 is reworded to be more explicit about what is being referred to as the cell reselection criteria.

3 - The requirement that a UE shall not reselect to a cell if less than 1s has elapsed since the UE has started to camp on the current serving cell is added to section 5.2.6.1.24.

4 - 'Cell reserved for future use' added to list of possible restrictions in 5.3.3.1

5 - Sections 5.4.1 and 5.4.1.1 referring to the 'initial cell reselection process' which is never triggered within 25.331 are removed.

6 - Unnecessary 'and' removed

7 - References to A/Gb mode and Iu mode changes to UTRA cell and GSM cell.

8 - References to PLMN selection and handover removed from section 4.1

9 - Reserved cell added to the list of cell categories

10 - Indentation correction in section 5.2.6.1.2

Isolated impact analysis:
Corrected functionality: Cell selection and reselection

Correction to a function where the specification was ambiguous or not sufficiently explicit. Would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise.</td>
</tr>
<tr>
<td>*Consequences if not approved:* ⌘</td>
<td colspan="2">The specification will remain ambiguous or insufficiently explicit.</td>
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<tr>
<td>*Clauses affected:* ⌘</td>
<td colspan="3">3.1, 4.1, 4.3, 5.2.1, 5.2.6.1.2, 5.2.6.1.4, 5.3.1.1, 5.4.1, 10.5</td>
</tr>
<tr>
<td rowspan="3">*Other specs affected:* ⌘</td>
<td></td>
<td>Other core specifications</td>
<td>⌘   25.304 v3.7.0, CR 083r1</td>
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<td>Test specifications</td>
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<td>O&M Specifications</td>
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<tr>
<td>*Other comments:* ⌘</td>
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</table>

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. ⌘

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following definitions and the definitions in [12] apply.

Acceptable Cell: a cell that satisfies certain conditions as specified in 4.3. A UE can always attempt emergency calls on an acceptable cell.

Available PLMN: a PLMN for which the UE has found at least one acceptable cell.

Barred Cell: A cell is barred if it is so indicated in the system information.

Camped on a cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

Camped on any cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

DRX cycle: individual time interval between monitoring Paging Occasion for a specific UE.

Equivalent PLMN: a PLMN considered as equivalent to the selected PLMN by the UE for PLMN selection, cell selection, cell reselection and handover according to the information provided by the NAS.

Home PLMN: a PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

Location Registration (LR): UE registers its presence in a registration area, for instance regularly or when entering a new registration area.

Maximum DRX cycle: time interval for the longest possible DRX cycle in a cell.

Paging Block Periodicity (PBP): period of the occurrence of Paging Blocks. (For FDD, PBP = 1).

Paging Message Receiving Occasion (TDD only)**:** the frame where the UE receives actual paging message.

Paging occasion:
(FDD) The SFN of the PICH frame where the UE monitors its paging indicator (i.e. the SFN of the PCCPCH frame in which the PICH frame begins).
(TDD) The paging block, which consists of several frames. The value of Paging Occasion is equal to the first frame of the Paging Block.

Process: a local action in the UE invoked by a RRC procedure or an Idle Mode procedure.

Radio Access Mode: radio access mode of the cell, FDD or TDD.

Radio Access Technology: type of technology used for radio access, for instance UTRA or GSM.

Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Selected PLMN: this is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: the cell on which the UE is camped.

Suitable Cell: This is a cell on which an UE may camp. For a UTRA cell, the criteria are defined in section 4.3, and for a GSM cell the criteria are defined in [1]. It must satisfy criteria which is defined for A/Gb mode in 3GPP [1] and for Iu mode in section 4.3.

4 General description of Idle mode

4.1 Overview

When a UE is switched on, a public land mobile network (PLMN) is selected and the UE searches for a suitable cell of this PLMN to camp on. Criteria for cell selection and cell re-selection between radio access technologies (RATs) described in this document only consider radio criteria. In addition to RAT, the PLMN type may differ as well. In this specification, the term PLMN is used as a generic term covering both GSM MAP and ANSI-41 type of PLMNs. According to the type of PLMN, the way to identify it can be different. If the PLMN type is GSM, the PLMN is identified by 'PLMN identity' and if the PLMN type is ANSI-41, the PLMN is identified by 'SID'

The NAS shall provide a list of equivalent PLMNs, if available, that the AS shall use for ~~PLMN selection,~~ cell selection, and cell reselection ~~and handover~~.

The UE searches for a suitable cell of the chosen PLMN and chooses that cell to provide available services, and tunes to its control channel. This choosing is known as "camping on the cell". The UE will, if necessary, then register its presence, by means of a NAS registration procedure, in the registration area of the chosen cell.

If the UE finds a more suitable cell, it reselects onto that cell and camps on it. If the new cell is in a different registration area, location registration is performed.

If necessary, the UE will look for more suitable cells on other PLMNs at regular time intervals, which is referred to as PLMN-reselection. This is described in [9].

If the UE loses coverage of the registered PLMN, either a new PLMN is selected automatically (automatic mode), or an indication of which PLMNs are available is given to the user, so that a manual selection can be made (manual mode).

Registration is not performed by UEs only capable of services that need no registration.

The purpose of camping on a cell in idle mode is fourfold:

a) It enables the UE to receive system information from the PLMN.

b) When registered and if the UE wishes to establish an RRC connection, it can do this by initially accessing the network on the control channel of the cell on which it is camped.

c) If the PLMN receives a call for the registered UE, it knows (in most cases) the registration area of the cell in which the UE is camped. It can then send a "paging" message for the UE on control channels of all the cells in the registration area. The UE will then receive the paging message because it is tuned to the control channel of a cell in that registration area and the UE can respond on that control channel.

d) It enables the UE to receive cell broadcast services.

If the UE is unable to find a suitable cell to camp on, or the USIM is not inserted, or if the location registration failed (except for LR rejected with cause #14 or cause #15, see [5] and [16]), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls.

The idle mode tasks can be subdivided into three processes:

- PLMN selection and reselection;

- Cell selection and reselection;

- Location registration.

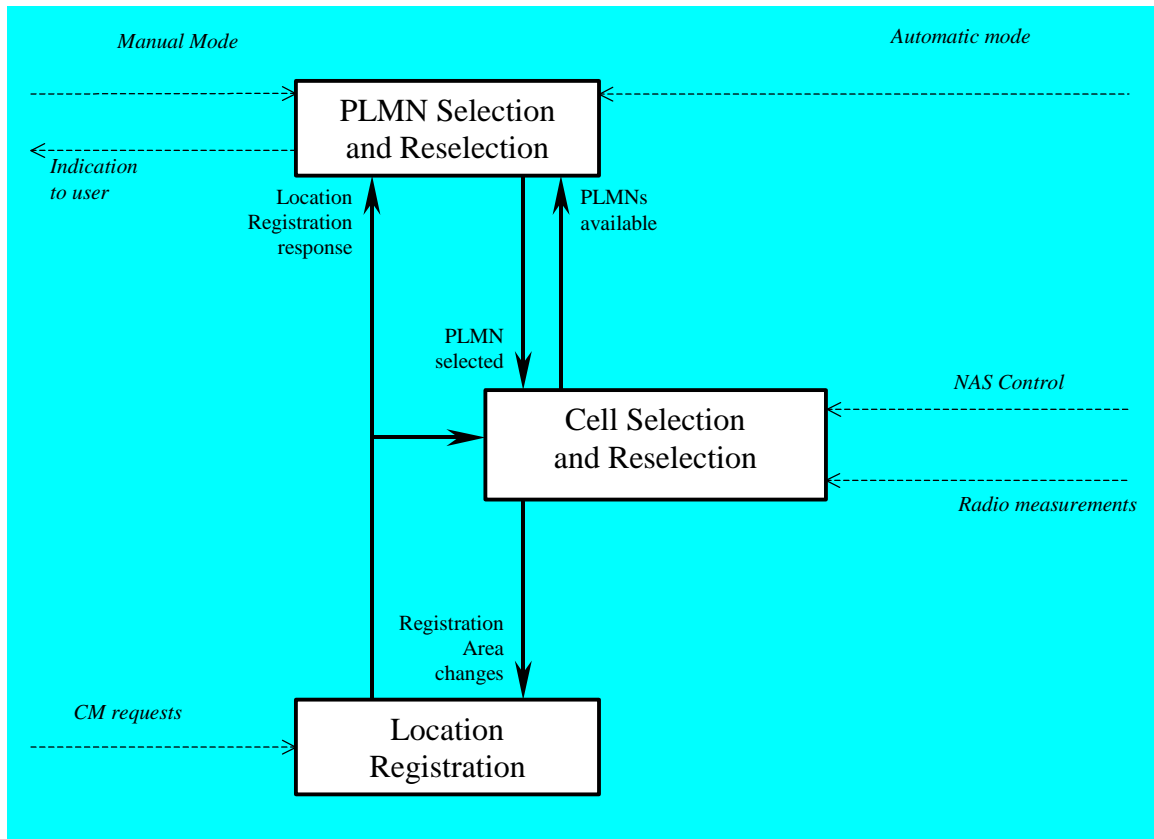The relationship between these processes is illustrated in Figure 1.

Figure 1: Overall Idle Mode process

4.3 Service type in Idle mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode.

The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE in idle mode:

- Limited service (emergency calls on an acceptable cell)

- Normal service (for public use on a suitable cell)

- Operator service (for operators only on a reserved cell)

Furthermore, the cells are categorised according to which services they offer:

acceptable cell:

An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls). Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call in a UTRAN network:

- The cell is not barred, see subclause 5.3.4.1

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2;

suitable cell:

A "suitable cell" is a cell on which the UE may camp on to obtain normal service. Such a cell shall fulfil all the following requirements.

- The cell is part of the selected PLMN or, of a PLMN considered as equivalent by the UE according to the information provided by the NAS.

- The cell is not barred, see subclause 5.3.4.1.

- The cell is not part of the list of "forbidden LAs for roaming" [9]

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2.

barred cell:

A cell is barred if it is so indicated in the system information [4].

reserved cell:

A cell is reserved if it is so indicated in system information [4].

5.2 Cell selection and reselection in idle mode

5.2.1 Introduction

As stated in clause 1, the present document applies to UEs that support at least UTRA.

Different types of measurements are used in different RATs and modes for the cell selection and reselection. ~~Whenever a direct comparison of these measurements is required, mapping functions will be applied that are defined in [4].~~ The performance requirements for the measurements are specified in [10] and [11].

The NAS can control the RAT(s) in which the cell selection should be performed, for instance by indicating RAT(s) associated with the selected PLMN, and by maintaining a list of forbidden registration area(s) and a list of equivalent PLMNs. The UE shall select a suitable cell and the radio access mode based on idle mode measurements and cell selection criteria.

In order to speed up the cell selection process, stored information for several RATs may be available in the UE.

When camped on a cell, the UE shall regularly search for a better cell according to the cell reselection criteria. If a better cell is found, that cell is selected. The change of cell may imply a change of RAT. Details on performance requirements for cell reselection can be found in [10] and [11].

The NAS is informed if the cell selection and reselection results in changes in the received system information.

For normal service, the UE has to camp on a suitable cell, tune to that cell's control channel(s) so that the UE can:

- Receive system information from the PLMN;

    - Receive registration area information from the PLMN, e.g., location area and routing area; and

    - Receive other AS and NAS Information;

- If registered:

    - receive paging and notification messages from the PLMN; and

    - initiate call setup for outgoing calls or other actions from the UE.

5.2.6.1.2 Measurement rules for cell re-selection when HCS is used

If the system information broadcast in the serving cell indicates that HCS is used, then for intra-frequency and inter-frequency measurements, the UE shall:

1. For intra-frequency and inter-frequency threshold-based measurement rules

   use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

   IF ($Srxlev_s <= Ssearch_{HCS}$) or (if FDD and $S_x <= S_{intersearch}$) THEN

       measure on all intra-frequency and inter-frequency cells

   ELSE

       IF ($S_x > S_{intrasearch}$) THEN

           measure on all intra-frequency and inter-frequency cells, which have higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

       ELSE

           measure on all intra-frequency and inter-frequency cells, which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

       ENDIF

   ENDIF

   If HCS is used and if $S_{intersearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells.

   If HCS is used and if $S_{intrasearch}$ is not sent for the serving cell, UE shall measure on all intra-frequency and inter-frequency cells.

2. For intra-frequency and inter-frequency measurement rules for fast-moving UEs: [Hans: Incorrect indent. Style changed from B1 to normal]

   If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

   - measure intra-frequency and inter-frequency neighbouring cells, which have equal or lower HCS priority than serving cell.

   - prioritise re-selection of intra-frequency and inter-frequency neighbouring cells on lower HCS priority level before neighbouring cells on same HCS priority level.

   When the number of cell reselections during time period T_{CRmax} no longer exceeds N_{CR}, UE shall

   - continue these measurements during time period $T_{CrmaxHyst}$, and

   - revert to measurements according to the threshold based measurement rules.

When serving cell belongs to a hierarchical cell structure, the UE shall follow these rules for Inter-RAT measurements:

1. Inter-RAT threshold-based measurement rules

   use Squal for FDD cells and Srxlev for TDD cells for Sx and apply the following rules.

   IF ($Srxlev_s <= S_{HCS,RATm}$) or (if FDD and $S_{qual} <= S_{SearchRATm}$) THEN

       UE shall measure on all inter-RATm cells

   ELSE

       IF ($S_x > S_{limit,SearchRATm}$) THEN

UE need not measure neighbouring cells in RAT "m"

ELSE

UE shall measure on all neighbouring cells in RAT "m", which have equal or higher HCS priority level than the serving cell unless measurement rules for fast-moving UEs are triggered

ENDIF

ENDIF

If HCS is used and if $S_{HCS,RATm}$ is not sent for the serving cell, UE shall measure on all inter-RATm cells.

2. Inter-RAT measurement rules for fast-moving UEs

    -   If the number of cell reselections during time period T_{CRmax} exceeds N_{CR}, high-mobility has been detected. In this high-mobility state, UE shall

        -   measure the neighbouring cells in RAT "m", which have an equal or lower HCS priority than the serving cell

        -   prioritise re-selection of neighbouring cells in RAT "m" on lower HCS priority level before neighbouring cells in RAT "m" on same HCS priority level.

    When the number of cell reselections during time interval T_{CRmax} no longer exceeds N_{CR}, UE shall

    -   continue these measurements during time period $T_{CrmaxHyst}$, and

    -   revert to measure according to the threshold-based measurement rules.

5.2.6.1.4 Cell Reselection Criteria

The following cell re-selection criteria are used for intra-frequency cells, inter-frequency cells and inter-RAT cells:

The quality level threshold criterion H for hierarchical cell structures is used to determine whether prioritised ranking according to hierarchical cell re-selection rules shall apply, and is defined by:

$$H_s = Q_{meas,s} - Qhcs_s$$

$$H_n = Q_{meas,n} - Qhcs_n - TO_n * L_n$$

If it is indicated in system information that HCS is not used, the quality level threshold criterion H is not applied.

The cell-ranking criterion R is defined by:

$$R_s = Q_{meas,s} + Qhyst_s$$

$$R_n = Q_{meas,n} - Qoffset_{s,n} - TO_n * (1 - L_n)$$

where:

$$TO_n = TEMP\_OFFSET_n * W(PENALTY\_TIME_n - T_n)$$

$$L_n = 0 \quad \text{if } HCS\_PRIO_n = HCS\_PRIO_s$$
$$L_n = 1 \quad \text{if } HCS\_PRIO_n <> HCS\_PRIO_s$$

$$W(x) = 0 \quad \text{for } x < 0$$
$$W(x) = 1 \quad \text{for } x >= 0$$

$TEMP\_OFFSET_n$ applies an offset to the H and R criteria for the duration of $PENALTY\_TIME_n$ after a timer T_n has started for that neighbouring cell.

$TEMP\_OFFSET_n$ and $PENALTY\_TIME_n$ are only applicable if the usage of HCS is indicated in system information.

The timer T_n is implemented for each neighbouring cell. T_n shall be started from zero when one of the following conditions becomes true:

- if $HCS\_PRIO_n <> HCS\_PRIO_s$ and

$$Q_{meas,n} > Qhcs_n$$

Or

- if $HCS\_PRIO_n = HCS\_PRIO_s$ and

    - for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH RSCP in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

    - for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Qoffset2_{s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

T_n for the associated neighbour cell shall be stopped as soon as any of the above conditions are no longer fulfilled. Any value calculated for TO_n is valid only if the associated timer T_n is still running else TO_n shall be set to zero.

At cell-reselection, a timer T_n is stopped only if the corresponding cell is not a neighbour cell of the new serving cell, or if the criteria given above for starting timer T_n for the corresponding cell is no longer fulfilled with the parameters of the new serving cell. On cell re-selection, timer T_n shall be continued to be run for the corresponding cells but the criteria given above shall be evaluated with parameters broadcast in the new serving cell if the corresponding cells are neighbours of the new serving cell.

S_n	Cell Selection value of the neighbouring cell, (dB)
Q_{meas}	Quality value. The quality value of the received signal derived from the averaged CPICH Ec/No or CPICH RSCP for FDD cells, from the averaged P-CCPCH RSCP for TDD cells and from the averaged received signal level for GSM cells. The averaging of these measurement quantities are performed as specified in [10] and [11]. For FDD cells, the measurement that is used to derive the quality value is set by the Cell_selection_and_reselection_quality_measure information element.

Cell reselection parameters broadcast in system information are listed in subclause 5.2.6.1.5.

The cell selection criterion S used for cell reselection criterion S is fulfilled when:

for FDD cells: $Srxlev > 0$ AND $Squal > 0$

for TDD cells: $Srxlev > 0$

for GSM cells: $Srxlev > 0$

Where :

$$Squal = Q_{qualmeas} - Qqualmin$$

$$Srxlev = Q_{rxlevmeas} - Qrxlevmin - Pcompensation$$

Squal	Cell Selection quality value (dB) Applicable only for FDD cells.
Srxlev	Cell Selection RX level value (dB)
$Q_{qualmeas}$	Measured cell quality value. The quality of the received signal expressed in CPICH E_C/N_0 (dB) for FDD cells. CPICH Ec/N0 shall be averaged as specified in [10]. Applicable only for FDD cells.
$Q_{rxlevmeas}$	Measured cell RX level value. This is received signal, CPICH RSCP for FDD cells (dBm), P-CCPCH RSCP for TDD cells (dBm) and the averaged received signal level as specified in [10] for GSM cells (dBm). CPICH RSCP, P-CCPCH RSCP and the received signal level for GSM cells shall be averaged as specified in [10] and [11].
Qqualmin	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Qrxlevmin	Minimum required RX level in the cell (dBm)
Pcompensation	max(UE_TXPWR_MAX_RACH – P_MAX, 0) (dB)
UE_TXPWR_MAX_RACH	Maximum TX power level an UE may use when accessing the cell on RACH (read in system information) (dBm)
P_MAX	Maximum RF output power of the UE (dBm)

The UE shall perform ranking of all cells that fulfil the S criterion among

- all cells that have the highest HCS_PRIO among those cells that fulfil the criterion H >= 0. Note that this rule is not valid when UE high-mobility is detected (see subclause 5.2.6.1.2).

- all cells, not considering HCS priority levels, if no cell fulfil the criterion H >= 0. This case is also valid when it is indicated in system information that HCS is not used, that is when serving cell does not belong to a hierarchical cell structure.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using CPICH RSCP, P-CCPCH RSCP and the averaged received signal level as specified in [10] and [11] for FDD, TDD and GSM cells, respectively.

The offset $Qoffset1_{s,n}$ is used for $Qoffset_{s,n}$ to calculate R_n, the hysteresis $Qhyst1_s$ is used for $Qhyst_s$ to calculate R_s.

If the usage of HCS is indicated in system information, $TEMP\_OFFSET1_n$ is used for $TEMP\_OFFSET_n$ to calculate TO_n. If it is indicated in system information that HCS is not used, $TEMP\_OFFSET_n$ is not applied when calculating R_n. The best ranked cell is the cell with the highest R value.

If a TDD or GSM cell is ranked as the best cell, then the UE shall perform cell re-selection to that TDD or GSM cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH RSCP, the UE shall perform cell re-selection to that FDD cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH Ec/No, the UE shall perform a second ranking of the FDD cells according to the R criteria specified above, but using the measurement quantity CPICH Ec/No for deriving the $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values of the FDD cells. The offset $Qoffset2_{s,n}$ is used for $Qoffset_{s,n}$ to calculate R_n, the hysteresis $Qhyst2_s$ is used for $Qhyst_s$ to calculate R_s. If the usage of HCS is indicated in system information, $TEMP\_OFFSET2_n$ is used to calculate TO_n. If it is indicated in system information that HCS is not used, $TEMP\_OFFSET_n$ is not applied when calculating R_n. Following this second ranking, the UE shall perform cell re-selection to the best ranked FDD cell.

In all cases, the UE shall reselect the new cell, only if the following conditions are met ~~cell reselection criteria are fulfilled during a time interval Treselection~~:.

- the new cell is better ranked than the serving cell during a time interval Treselection.

- more than 1 second has elapsed since the UE camped on the current serving cell.

5.3 Cell Access Restrictions

5.3.1 UTRA cells

There are two mechanisms which allow an operator to impose cell access restrictions. The first mechanism uses indication of cell status and special reservations for control of cell selection and re-selection procedures. The second mechanism, referred to as Access Control, shall allow to prevent selected classes of users from sending initial access messages for load control reasons. At subscription, one or more Access Classes are allocated to the subscriber and stored in the USIM [9], which are employed for this purpose.

5.3.1.1 Cell status and cell reservations

Cell status and cell reservations are indicated with the *Cell Access Restriction* Information Element in the System Information Message [4] by means of three Information Elements:

- Cell barred (IE type: "barred" or "not barred"),

- Cell Reserved for operator use (IE type: "reserved" or "not reserved"),

- Cell reserved for future extension (IE type: " reserved" or "not reserved")

When cell status is indicated as "not barred", "not reserved" for operator use and "not reserved" for future extension (Cell Reservation Extension),

- the UE may select/re-select this cell during the cell selection and cell re-selection procedures in Idle mode and in Connected mode.

When cell status is indicated as "not barred", "not reserved" for operator use and "reserved" for future extension (Cell Reservation Extension),

- UEs shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status is indicated as "not barred" and "reserved" for operator use,

- UEs assigned to an Access Class in the range 11 to 15 may select/re-select this cell if in the home PLMN.

- UEs assigned to an Access Class in the range 0 to 9 shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status "barred" is indicated,

- The UE is not permitted to select/re-select this cell, not even for emergency calls.

- The UE shall ignore the "Cell Reserved for future extension (Cell Reservation Extension) use" IE.

- The UE shall select another cell according to the following rule:

  - If the "Intra-frequency cell re-selection indicator" IE in Cell Access Restriction IE is set to value "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.

    - If the UE is camping on another cell, the UE shall exclude the barred cell from the neighbouring cell list until the expiry of a time interval T_{barred}. The time interval T_{barred} is sent via system information in a barred cell together with Cell status information in the Cell Access Restriction IE.

    - If the UE does not select another cell, and the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

  - If the "Intra-frequency cell re-selection indicator" IE is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell. For emergency call, the Intra-frequency cell re-selection indicator IE" shall be ignored, i.e. even if it is set to "not allowed" the UE may select another intra-frequency cell.

- If the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

5.3.1.2   Access Control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [4].

The UE shall ignore Access Class related cell access restrictions when selecting a cell to camp on, i.e. it shall not reject a cell for camping on because access on that cell is not allowed for any of the Access Classes of the UE. A change of the indicated access restriction shall not trigger cell re-selection by the UE.

Access Class related cell access restrictions shall be checked by the UE before sending an RRC CONNECTION REQUEST message when entering Connected Mode from UTRAN Idle mode. Cell access restrictions associated with the Access Classes shall not apply when the initial access for entering Connected Mode is triggered by an Inter-RAT cell re-selection to UTRAN, and for a UE which already is in Connected Mode.

5.3.1.3   Emergency Call

Emergency calls shall be allowed in all cells whose barred status is not barred, independent of restrictions due to cell reservations.

A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [4]. Full details of operation under "Access class barred list" are described in [9].

5.3.2   GSM cells

The cell access restrictions applicable to GSM are specified in [1].

5.4   Cell Reselection Processes in RRC Connected Mode

5.4.1   VoidInitial Cell Reselection Process

Triggers for the Initial cell re-selection process are specified in [4].

The UE shall attempt to find a suitable cell belonging to the selected PLMN and select it.

If the UE is unable to find any suitable cell, the UE shall release the RRC connection and enter idle mode.

5.4.1.1   Criteria

The criteria for initial cell reselection are specified in subclause5.2.6.1.4.

5.4.2   Void

5.4.3   Cell Reselection Process

The *cell reselection* process in Connected Mode is the same as *cell reselection evaluation process* used for idle mode, described in subclause 5.2.6.
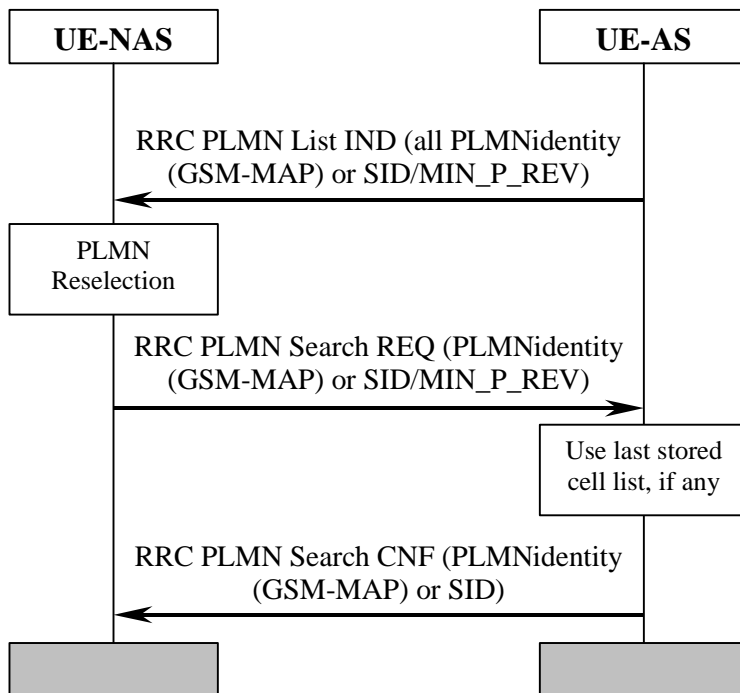
10.5 PLMN Reselection, automatic mode

Figure 9: PLMN Reselection, automatic mode

Triggered by, for instance, a timer in NAS, AS is requested to send a list to NAS with all PLMNs currently available. The list includes the identities of available PLMNs ~~and~~. Assuming that a PLMN with higher priority is found, NAS requests AS to select a suitable cell belonging to the PLMN with highest priority. When searching for the requested PLMN and in order to speed up the search, AS may use a list of cell information previously stored. When a suitable cell

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CHANGE REQUEST

⌘ **25.304** CR **085** ⌘ rev **-** ⌘ Current version: **3.7.0** ⌘

*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 ☐ Core Network ☐

Title:	⌘	Correction to cells reserved for operator use
Source:	⌘	TSG-RAN WG2
Work item code: ⌘		TEI ***Date:*** ⌘ August 27th, 2001
Category:	⌘ **F**	***Release:*** ⌘ R99

Use <u>one</u> of the following categories:
F (essential 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 <u>one</u> 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:	⌘	TS 25.304 v3.7.0 is not inline with TS 22.011 on the behaviour of UEs assigned to AC 11 to 15. Only UEs with AC 11 and/or AC 15 should be allowed to reselect to cells which are "reserved for operator use" while in HomePLMN. AC 12 to 14 are special access classes assigned e.g. to emergency or security staff (see TS 22.011) etc. and those UEs shouldn't be allowed to camp on operator cells, but instead shall reselect to other cells in a specified manner.

Summary of change:	⌘	UEs with AC 12, 13 and 14 are not allowed to reselect to cells which are reserved for operator use.
		Reference in chapter 4.3 corrected.
		Isolated Impact Analysis
		Only impact to UEs with assigned AC 12, 13 or 14. UEs having not implemented this CR behave not correctly on cells reserved for operator use when belonging to AC 12, 13 or 14 and may lose service if operator reserved cell remains best cell and is not under full operation.

Consequences if not approved:	⌘	Also UEs which are not under the control of the network operator are allowed to reselect to cells which are "reserved for operator use" and in cases where these cells are instable UEs potentially are not able to get service although other cells may be available (e.g. other UMTS or GSM cells).

Clauses affected:	⌘	4.3, 5.3.1.1		

Other specs Affected:	⌘		Other core specifications	⌘	25.304 v4.1.0, CR 086
			Test specifications		
			O&M Specifications		

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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

4.3 Service type in Idle mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode.
The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE in idle mode:

- Limited service (emergency calls on an acceptable cell)

- Normal service (for public use on a suitable cell)

- Operator service (for operators only on a reserved cell)

Furthermore, the cells are categorised according to which services they offer:

acceptable cell:

An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls). Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call in a UTRAN network:

- The cell is not barred, see subclause 5.3.4.15.3.1.1

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2;

suitable cell:

A "suitable cell" is a cell on which the UE may camp on to obtain normal service. Such a cell shall fulfil all the following requirements.

- The cell is part of the selected PLMN or, of a PLMN considered as equivalent by the UE according to the information provided by the NAS.

- The cell is not barred, see subclause 5.3.4.1. 5.3.1.1

- The cell is not part of the list of "forbidden LAs for roaming" [9]

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2.

barred cell:

A cell is barred if it is so indicated in the system information [4].

5.3 Cell Access Restrictions

5.3.1 UTRA cells

There are two mechanisms which allow an operator to impose cell access restrictions. The first mechanism uses indication of cell status and special reservations for control of cell selection and re-selection procedures. The second mechanism, referred to as Access Control, shall allow to prevent selected classes of users from sending initial access messages for load control reasons. At subscription, one or more Access Classes are allocated to the subscriber and stored in the USIM [9], which are employed for this purpose.

5.3.1.1 Cell status and cell reservations

Cell status and cell reservations are indicated with the *Cell Access Restriction* Information Element in the System Information Message [4] by means of three Information Elements:

- Cell barred (IE type: "barred" or "not barred"),

- Cell Reserved for operator use (IE type: "reserved" or "not reserved"),

When cell status is indicated as "not barred", "not reserved" for operator use and "not reserved" for future extension (Cell Reservation Extension),

- the UE may select/re-select this cell during the cell selection and cell re-selection procedures in Idle mode and in Connected mode.

When cell status is indicated as "not barred", "not reserved" for operator use and "reserved" for future extension (Cell Reservation Extension),

- UEs shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status is indicated as "not barred" and "reserved" for operator use,
- UEs assigned to ~~an~~ Access Class ~~in the range~~ 11 ~~to~~or 15 may select/re-select this cell if in the home PLMN.

- UEs assigned to an Access Class in the range 0 to 9 <u>and 12 to 14</u> shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status "barred" is indicated,
- The UE is not permitted to select/re-select this cell, not even for emergency calls.

- The UE shall ignore the "Cell Reserved for future extension (Cell Reservation Extension) use" IE.

- The UE shall select another cell according to the following rule:

  - If the "Intra-frequency cell re-selection indicator" IE in Cell Access Restriction IE is set to value "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.

    - If the UE is camping on another cell, the UE shall exclude the barred cell from the neighbouring cell list until the expiry of a time interval T_{barred}. The time interval T_{barred} is sent via system information in a barred cell together with Cell status information in the Cell Access Restriction IE.

    - If the UE does not select another cell, and the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

  - If the "Intra-frequency cell re-selection indicator" IE is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell. For emergency call, the Intra-frequency cell re-selection indicator IE" shall be ignored, i.e. even if it is set to "not allowed" the UE may select another intra-frequency cell.

    - If the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

<u>The reselection to another cell may also include a change of RAT.</u>

5.3.1.2   Access Control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [4].
The UE shall ignore Access Class related cell access restrictions when selecting a cell to camp on, i.e. it shall not reject a cell for camping on because access on that cell is not allowed for any of the Access Classes of the UE. A change of the indicated access restriction shall not trigger cell re-selection by the UE.
Access Class related cell access restrictions shall be checked by the UE before sending an RRC CONNECTION REQUEST message when entering Connected Mode from UTRAN Idle mode. Cell access restrictions associated with the Access Classes shall not apply when the initial access for entering Connected Mode is triggered by an Inter-RAT cell re-selection to UTRAN, and for a UE which already is in Connected Mode.

5.3.1.3   Emergency Call

Emergency calls shall be allowed in all cells whose barred status is not barred, independent of restrictions due to cell reservations.
A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [4]. Full details of operation under "Access class barred list" are described in [9].

5.3.2   GSM cells

The cell access restrictions applicable to GSM are specified in [1].

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CHANGE REQUEST

⌘ **25.304** CR **086** ⌘ rev **-** ⌘ Current version: **4.1.0** ⌘

*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 ☐ Core Network ☐

Title: ⌘	Correction to cells reserved for operator use	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	*Date:* ⌘ August 30ᵗʰ, 2001
Category: ⌘	**A**	*Release:* ⌘ REL-4

Use one of the following categories:
F (essential 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: ⌘	R'99 version of this spec was corrected with agreed CR 085, because: TS 25.304 v3.7.0 is not inline with TS 22.011 on the behaviour of UEs assigned to AC 11 to 15. Only UEs with AC 11 and/or AC 15 should be allowed to reselect to cells which are "reserved for operator use" while in HomePLMN. AC 12 to 14 are special access classes assigned e.g. to emergency or security staff (see TS 22.011) etc. and those UEs shouldn't be allowed to camp on operator cells, but instead shall reselect to other cells in a specified manner.
Summary of change: ⌘	UEs with AC 12, 13 and 14 are not allowed to reselect to cells which are reserved for operator use. Reference in chapter 4.3 corrected. **Isolated Impact Analysis** Only impact to UEs with assigned AC 12, 13 or 14. UEs having not implemented this CR behave not correctly on cells reserved for operator use when belonging to AC 12, 13 or 14 and may lose service if operator reserved cell remains best cell and is not under full operation.
Consequences if not approved: ⌘	Also UEs which are not under the control of the network operator are allowed to reselect to cells which are "reserved for operator use" and in cases where these cells are instable UEs potentially are not able to get service although other cells may be available (e.g. other UMTS or GSM cells).

Clauses affected:	⌘	4.3, 5.3.1.1		

Other specs Affected:	⌘		Other core specifications	⌘	25.304 v3.7.0, CR 085
			Test specifications		
			O&M Specifications		

Other comments:	⌘		

4.3 Service type in Idle mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode.
The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE in idle mode:

- Limited service (emergency calls on an acceptable cell)

- Normal service (for public use on a suitable cell)

- Operator service (for operators only on a reserved cell)

Furthermore, the cells are categorised according to which services they offer:
acceptable cell:
An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls). Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call in a UTRAN network:

- The cell is not barred, see subclause 5.3.4.15.3.1.1.

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2;

suitable cell:
A "suitable cell" is a cell on which the UE may camp on to obtain normal service. Such a cell shall fulfil all the following requirements.

- The cell is part of the selected PLMN or, of a PLMN considered as equivalent by the UE according to the information provided by the NAS.

- The cell is not barred, see subclause 5.3.4.15.3.1.1.

- The cell is not part of the list of "forbidden LAs for roaming" [9]

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2.

barred cell:
A cell is barred if it is so indicated in the system information [4].

5.3 Cell Access Restrictions

5.3.1 UTRA cells

There are two mechanisms which allow an operator to impose cell access restrictions. The first mechanism uses indication of cell status and special reservations for control of cell selection and re-selection procedures. The second mechanism, referred to as Access Control, shall allow to prevent selected classes of users from sending initial access messages for load control reasons. At subscription, one or more Access Classes are allocated to the subscriber and stored in the USIM [9], which are employed for this purpose.

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- Cell Reserved for operator use (IE type: "reserved" or "not reserved"),

When cell status is indicated as "not barred", "not reserved" for operator use and "not reserved" for future extension (Cell Reservation Extension),

- the UE may select/re-select this cell during the cell selection and cell re-selection procedures in Idle mode and in Connected mode.

When cell status is indicated as "not barred", "not reserved" for operator use and "reserved" for future extension (Cell Reservation Extension),

- UEs shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status is indicated as "not barred" and "reserved" for operator use,

- UEs assigned to ~~an~~ Access Class ~~in the range~~ 11 ~~to~~or 15 may select/re-select this cell if in the home PLMN.

- UEs assigned to an Access Class in the range 0 to 9 and 12 to 14 shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status "barred" is indicated,

- The UE is not permitted to select/re-select this cell, not even for emergency calls.

- The UE shall ignore the "Cell Reserved for future extension (Cell Reservation Extension) use" IE.

- The UE shall select another cell according to the following rule:

  - If the "Intra-frequency cell re-selection indicator" IE in Cell Access Restriction IE is set to value "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.

    - If the UE is camping on another cell, the UE shall exclude the barred cell from the neighbouring cell list until the expiry of a time interval T_{barred}. The time interval T_{barred} is sent via system information in a barred cell together with Cell status information in the Cell Access Restriction IE.

    - If the UE does not select another cell, and the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

  - If the "Intra-frequency cell re-selection indicator" IE is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell. For emergency call, the Intra-frequency cell re-selection indicator IE" shall be ignored, i.e. even if it is set to "not allowed" the UE may select another intra-frequency cell.

    - If the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

 The reselection to another cell may also include a change of RAT.

5.3.1.2   Access Control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [4].
The UE shall ignore Access Class related cell access restrictions when selecting a cell to camp on, i.e. it shall not reject a cell for camping on because access on that cell is not allowed for any of the Access Classes of the UE. A change of the indicated access restriction shall not trigger cell re-selection by the UE.
Access Class related cell access restrictions shall be checked by the UE before sending an RRC CONNECTION REQUEST message when entering Connected Mode from UTRAN Idle mode. Cell access restrictions associated with the Access Classes shall not apply when the initial access for entering Connected Mode is triggered by an Inter-RAT cell re-selection to UTRAN, and for a UE which already is in Connected Mode.

5.3.1.3   Emergency Call

Emergency calls shall be allowed in all cells whose barred status is not barred, independent of restrictions due to cell reservations.
A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [4]. Full details of operation under "Access class barred list" are described in [9].

5.3.2   GSM cells

The cell access restrictions applicable to GSM are specified in [1].

3GPP TSG-RAN WG2 Meeting #23   *Tdoc R2-012134*
Helsinki, Finland, August 27th- 31st 2001

CR-Form-v3

CHANGE REQUEST

⌘   **25.304 CR 087**   ⌘   rev **r1** ⌘   Current version: **3.7.0** ⌘

*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:	⌘	Service type also valid in RRC Connected Mode.
Source:	⌘	TSG-RAN WG2

Work item code: ⌘	TEI		***Date:*** ⌘	2001-08-30

Category:	⌘	**F**	***Release:*** ⌘	R99

Use one of the following categories:
    F *(essential 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:	⌘	Clarification that service type also is valid in connected mode.
Summary of change: ⌘		1. Update chapter 4.3 so that the Service Type also is valid in RRC connected mode. **Isolated impact**: This correction has isolated impact. The correction clarifies that the idle mode performance also are valid in connected mode. The change would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise. 2. It is added in table 1 for cell reselection" that NAS should maintain a list of forbidden LA's and provide it to AS.
Consequences if not approved:	⌘	Services valid also in RRC connected mode, will not be used.

Clauses affected:	⌘	4.2, 4.3, ~~5.2.1~~

Other specs affected:	⌘	☐	Other core specifications ⌘	25.304 v4.1.0, CR 088
		☐	Test specifications	
		☐	O&M Specifications	

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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

4.2 Functional division between AS and NAS in Idle mode

Table 1 presents the functional division between UE non-access stratum (NAS) and UE access stratum (AS) in idle mode. The NAS part is specified in [5] and the AS part in the present document. Examples of different idle mode procedures are presented in Clause 10.

Table 1: Functional division between AS and NAS in idle mode

Idle Mode Process	UE Non-Access Stratum	UE Access Stratum
PLMN Selection and Reselection	Maintain the list of allowed PLMN types. It can be GSM-MAP only, ANSI-41 only or both. Maintain a list of PLMNs in priority order according to [5]. Select a PLMN using automatic or manual mode as specified in [5] and request AS to select a cell belonging to this PLMN. For each PLMN, associated RAT(s) may be set. Evaluate reports of available PLMNs from AS for PLMN selection. Maintain a list of equivalent PLMN identities.	Search for available PLMNs. If associated RAT(s) is (are) set for the PLMN, search in this (these) RAT(s) and other RAT(s) for that PLMN as specified in [5]. Perform measurements to support PLMN selection. Synchronise to a broadcast channel to identify found PLMNs. Report available PLMNs with associated PLMN type and RAT to NAS on request from NAS or autonomously. It shall respect allowed PLMN types indications from NAS.
Cell Selection	Control cell selection for example by indicating RAT(s) associated with the selected PLMN to be used initially in the search of a cell in the cell selection. NAS is also maintaining lists of forbidden registration areas.	Perform measurements needed to support cell selection. Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS. Search for a suitable cell belonging to the PLMN requested by NAS. The cells broadcast their 'PLMN identity' (GSM-MAP) or 'SID' in the system information. Respond to NAS whether such cell is found or not. If associated RATs is (are) set for the PLMN, perform the search in this (these) RAT(s) and other RATs for that PLMN as specified in [5]. If such a cell is found, the cell is selected to camp on.
Cell Reselection	Control cell reselection by for example, maintaining lists of forbidden registration areas. Maintain a list of equivalent PLMN identities and provide the list to AS. Maintain a list of forbidden LAs and provide the list to AS	Perform measurements needed to support cell reselection. Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS. Change cell if a more suitable cell is found.
Location registration	Register the UE as active after power on. Register the UE's presence in a registration area, for instance regularly or when entering a new registration area. Maintain lists of forbidden LAs. Deregister UE when shutting down.	Report registration area information to NAS.

4.3 Service type in Idle ~~mode~~ and Connected Mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode and Connected Mode.

The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE

~~in idle mode~~

- Limited service (emergency calls on an acceptable cell)

- Normal service (for public use on a suitable cell)

- Operator service (for operators only on a reserved cell)

Furthermore, the cells are categorised according to which services they offer:

acceptable cell:

An "acceptable cell" is a cell on which the UE may camp to obtain limited service (originate emergency calls). Such a cell shall fulfil the following requirements, which is the minimum set of requirements to initiate an emergency call in a UTRAN network:

- The cell is not barred, see subclause 5.3.4.1

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2;

 suitable cell:

A "suitable cell" is a cell on which the UE may camp on to obtain normal service. Such a cell shall fulfil all the following requirements.

- The cell is part of the selected PLMN or, of a PLMN considered as equivalent by the UE according to the information provided by the NAS.

- The cell is not barred, see subclause 5.3.4.1.

- The cell is not part of the list of "forbidden LAs for roaming" [9].

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2.

barred cell:

A cell is barred if it is so indicated in the system information [4].

Exceptions to these definitions are applicable for UEs during emergency calls.

If a UE has an ongoing emergency call, all acceptable cells of that PLMN are treated as suitable for cell reselection for the duration of the emergency call.

3GPP TSG-RAN WG2 Meeting #23 　　　　　　　　　　　　　　*Tdoc R2-012176*
Helsinki, Finland, August 27ᵗʰ- 31ˢᵗ 2001

								CR-Form-v3

<table>
<tr><td colspan="9" align="center">CHANGE REQUEST</td></tr>
<tr><td>⌘</td><td colspan="2">25.304 CR 088</td><td>⌘ rev</td><td>-</td><td>⌘</td><td>Current version:</td><td>4.1.0</td><td>⌘</td></tr>
</table>

*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:	⌘	Service type also valid in RRC Connected Mode.
Source:	⌘	TSG-RAN WG2
Work item code: ⌘	TEI	***Date:*** ⌘ 2001-08-31
Category:	⌘ **A**	***Release:*** ⌘ REL-4

Use *one* of the following categories:
F (essential 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:	⌘	Clarification that service type also is valid in connected mode.

Summary of change: ⌘		1. Update chapter 4.3 so that the Service Type also is valid in RRC connected mode.
		Isolated impact: This correction has isolated impact. The correction clarifies that the idle mode performance also are valid in connected mode. The change would not affect implementations behaving like indicated in the CR, would affect implementations supporting the corrected functionality otherwise.
		2. It is added in table 1 for cell reselection" that NAS should maintain a list of forbidden LA's and provide it to AS.

Consequences if not approved:	⌘	Services valid also in RRC connected mode, will not be used.

Clauses affected:	⌘	4.2, 4.3

Other specs affected:	⌘ ☐	Other core specifications	⌘	25.304 v3.7.0, CR 087r1
	☐	Test specifications		
	☐	O&M Specifications		

Other comments:	⌘	

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4.2 Functional division between AS and NAS in Idle mode

Table 1 presents the functional division between UE non-access stratum (NAS) and UE access stratum (AS) in idle mode. The NAS part is specified in [5] and the AS part in the present document. Examples of different idle mode procedures are presented in Clause 10.

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Cell Selection	Control cell selection for example by indicating RAT(s) associated with the selected PLMN to be used initially in the search of a cell in the cell selection. NAS is also maintaining lists of forbidden registration areas.	Perform measurements needed to support cell selection. Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS. Search for a suitable cell belonging to the PLMN requested by NAS. The cells broadcast their 'PLMN identity' (GSM-MAP) or 'SID' in the system information. Respond to NAS whether such cell is found or not. If associated RATs is (are) set for the PLMN, perform the search in this (these) RAT(s) and other RATs for that PLMN as specified in [5]. If such a cell is found, the cell is selected to camp on.
Cell Reselection	Control cell reselection by for example, maintaining lists of forbidden registration areas. Maintain a list of equivalent PLMN identities and provide the list to AS. Maintain a list of forbidden LAs and provide the list to AS	Perform measurements needed to support cell reselection. Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS. Change cell if a more suitable cell is found.
Location registration	Register the UE as active after power on. Register the UE's presence in a registration area, for instance regularly or when entering a new registration area. Maintain lists of forbidden LAs. Deregister UE when shutting down.	Report registration area information to NAS.

4.3　　Service type in Idle ~~mode~~ and Connected Mode

This clause defines the level of service that may be provided by the network to a UE in Idle mode and Connected Mode.

The action of camping on a cell is necessary to get access to some services. Three levels of services are defined for UE

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- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2;

suitable cell:

A "suitable cell" is a cell on which the UE may camp on to obtain normal service. Such a cell shall fulfil all the following requirements.

- The cell is part of the selected PLMN or, of a PLMN considered as equivalent by the UE according to the information provided by the NAS.

- The cell is not barred, see subclause 5.3.4.1.

- The cell is not part of the list of "forbidden LAs for roaming" [9].

- The cell selection criteria are fulfilled, see subclause 5.2.3.1.2.

barred cell:

A cell is barred if it is so indicated in the system information [4].

Exceptions to these definitions are applicable for UEs during emergency calls.

If a UE has an ongoing emergency call, all acceptable cells of that PLMN are treated as suitable for cell reselection for the duration of the emergency call.

3GPP TSG-RAN WG2 Meeting #23
Helsinki, Finland, 27-31 August 2001

R2-012139

CR-Form-v4

CHANGE REQUEST

⌘ **25.304** CR **089** ⌘ .rev **-** ⌘ Current version: **3.7.0** ⌘

*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 ☐ Core Network ☐

Title: ⌘	Cell access restrictions for emergency calls ("Access Class 10 bit")	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ August 31st 2001

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: ⌘	Currently it is not clearly stated in this spec, that UEs are not allowed to initiate emergency calls, when access class 10 is indicated as barred.
Summary of change: ⌘	▪ Sentence added, describing how UE shall behave, if cell indicates that access class 10 is barred.
	▪ Definiton of Access class added; Definition of Cell reservation and Cell restriction status for a cell added.
Consequences if not approved: ⌘	Unclear specification and UE may try to access cell for emergency calls though access class 10 bit is indicated in system informations as barred.

Clauses affected: ⌘	3.1, 5.3, 5.3.1, 5.3.1.3

Other specs affected: ⌘	☐ Other core specifications ⌘	25.304 v4.1.0, CR 090
	☐ Test specifications	
	☐ O&M Specifications	

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.

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following definitions and the definitions in [12] apply.

Acceptable Cell: a cell that satisfies certain conditions as specified in 4.3. A UE can always attempt emergency calls on an acceptable cell.

Available PLMN: a PLMN for which the UE has found at least one acceptable cell.

Barred Cell: A cell a UE is not allowed to camp on.is barred if it is so indicated in the system information.

Camped on a cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

Camped on any cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

DRX cycle: individual time interval between monitoring Paging Occasion for a specific UE.

Equivalent PLMN: a PLMN considered as equivalent to the selected PLMN by the UE for PLMN selection, cell selection, cell reselection and handover according to the information provided by the NAS.

Home PLMN: a PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

Location Registration (LR): UE registers its presence in a registration area, for instance regularly or when entering a new registration area.

Maximum DRX cycle: time interval for the longest possible DRX cycle in a cell.

Paging Block Periodicity (PBP): period of the occurrence of Paging Blocks. (For FDD, PBP = 1).

Paging Message Receiving Occasion (TDD only)**:** the frame where the UE receives actual paging message.

Paging occasion:
(FDD) The SFN of the PICH frame where the UE monitors its paging indicator (i.e. the SFN of the PCCPCH frame in which the PICH frame begins).
(TDD) The paging block, which consists of several frames. The value of Paging Occasion is equal to the first frame of the Paging Block.

Process: a local action in the UE invoked by a RRC procedure or an Idle Mode procedure.

Radio Access Mode: radio access mode of the cell, FDD or TDD.

Radio Access Technology: type of technology used for radio access, for instance UTRA or GSM.

Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Reserved Cell: A cell on which camping is not allowed, except for particular UEs, if so indicated in the system information.

Restricted Cell: A cell on which camping is allowed, but access attempts are disallowed for UEs whose access classes are indicated as barred.

Selected PLMN: this is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: the cell on which the UE is camped.

Suitable Cell: This is a cell on which an UE may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP [1] and for Iu mode in section 4.3.

+++++++++++++ next modified section +++++++++++++++

5.3   Cell Reservations and Access Restrictions

5.3.1   UTRA cells

There are two mechanisms which allow an operator to impose cell reservations or access restrictions. The first mechanism uses indication of cell status and special reservations for control of cell selection and re-selection procedures. The second mechanism, referred to as Access Control, shall allow to prevent selected classes of users from sending initial access messages for load control reasons. At subscription, one or more Access Classes are allocated to the subscriber and stored in the USIM [9], which are employed for this purpose.

5.3.1.1   Cell status and cell reservations

Cell status and cell reservations are indicated with the *Cell Access Restriction* Information Element in the System Information Message [4] by means of three Information Elements:

- Cell barred (IE type: "barred" or "not barred"),

- Cell Reserved for operator use (IE type: "reserved" or "not reserved"),

When cell status is indicated as "not barred", "not reserved" for operator use and "not reserved" for future extension (Cell Reservation Extension),

- the UE may select/re-select this cell during the cell selection and cell re-selection procedures in Idle mode and in Connected mode.

When cell status is indicated as "not barred", "not reserved" for operator use and "reserved" for future extension (Cell Reservation Extension),

- UEs shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status is indicated as "not barred" and "reserved" for operator use,

- UEs assigned to an Access Class in the range 11 to 15 may select/re-select this cell if in the home PLMN.

- UEs assigned to an Access Class in the range 0 to 9 shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status "barred" is indicated,

- The UE is not permitted to select/re-select this cell, not even for emergency calls.

- The UE shall ignore the "Cell Reserved for future extension (Cell Reservation Extension) use" IE.

- The UE shall select another cell according to the following rule:

  - If the "Intra-frequency cell re-selection indicator" IE in Cell Access Restriction IE is set to value "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.

    - If the UE is camping on another cell, the UE shall exclude the barred cell from the neighbouring cell list until the expiry of a time interval T_{barred}. The time interval T_{barred} is sent via system information in a barred cell together with Cell status information in the Cell Access Restriction IE.

- If the UE does not select another cell, and the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T$_{barred}$ again check whether the status of the barred cell has changed.

- If the "Intra-frequency cell re-selection indicator" IE is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell. For emergency call, the Intra-frequency cell re-selection indicator IE" shall be ignored, i.e. even if it is set to "not allowed" the UE may select another intra-frequency cell.

- If the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T$_{barred}$ again check whether the status of the barred cell has changed.

5.3.1.2 Access Control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [4].

The UE shall ignore Access Class related cell access restrictions when selecting a cell to camp on, i.e. it shall not reject a cell for camping on because access on that cell is not allowed for any of the Access Classes of the UE. A change of the indicated access restriction shall not trigger cell re-selection by the UE.

Access Class related cell access restrictions shall be checked by the UE before sending an RRC CONNECTION REQUEST message when entering Connected Mode from UTRAN Idle mode. Cell access restrictions associated with the Access Classes shall not apply when the initial access for entering Connected Mode is triggered by an Inter-RAT cell re-selection to UTRAN, and for a UE which already is in Connected Mode.

5.3.1.3 Emergency Call

Emergency calls shall be allowed in all cells whose barred status is not barred, independent of restrictions due to cell reservations.

A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [4]. If access class 10 is indicated as barred in a cell, UEs with access class 0 to 9 or without an IMSI are not allowed to initiate emergency calls in this cell. For UEs with access classes 11 to 15, emergency calls are not allowed if both access class 10 and the relevant access class (11 to 15) are barred. Otherwise, emergency calls are allowed for those UEs.

Full details of operation under "Access class barred list" are described in [9].

5.3.2 GSM cells

The cell access restrictions applicable to GSM are specified in [1].

3GPP TSG-RAN WG2 Meeting #23 *R2-012189*
Helsinki, Finland, 27-31 August 2001

CHANGE REQUEST

⌘ **25.304** CR **090** ⌘ rev **-** ⌘ Current version: **4.1.0** ⌘

*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 ☐ Core Network ☐

Title: ⌘	Cell access restrictions for emergency calls ("Access Class 10 bit")	
Source: ⌘	TSG-RAN WG2	
Work item code: ⌘	TEI	***Date:*** ⌘ August 31st 2001

Work item code: ⌘ TEI   ***Date:*** ⌘ August 31st 2001

Category: ⌘ **A**   ***Release:*** ⌘ REL-4

Use one of the following categories:
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R97   *(Release 1997)*
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REL-5 *(Release 5)*

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Summary of change: ⌘	▪ Sentence added, describing how UE shall behave, if cell indicates that access class 10 is barred. ▪ Definiton of Access class added; Definition of Cell reservation and Cell restriction status for a cell added.
Consequences if not approved: ⌘	Unclear specification and UE may try to access cell for emergency calls though access class 10 bit is indicated in system informations as barred.

Clauses affected: ⌘	3.1, 5.3, 5.3.1, 5.3.1.3	
Other specs affected: ⌘	☐ Other core specifications ⌘	25.304 v3.7.0, CR 089
	☐ Test specifications	
	☐ O&M Specifications	
Other comments: ⌘		

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Home PLMN: a PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

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Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Reserved Cell: A cell on which camping is not allowed, except for particular UEs, if so indicated in the system information.

Restricted Cell: A cell on which camping is allowed, but access attempts are disallowed for UEs whose access classes are indicated as barred

Selected PLMN: this is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: the cell on which the UE is camped.

Suitable Cell: This is a cell on which an UE may camp. It must satisfy criteria which is defined for A/Gb mode in 3GPP [1] and for Iu mode in section 4.3.

+++++++++++++ next modified section ++++++++++++++

5.3 Cell Reservations and Access Restrictions

5.3.1 UTRA cells

There are two mechanisms which allow an operator to impose cell reservations or access restrictions. The first mechanism uses indication of cell status and special reservations for control of cell selection and re-selection procedures. The second mechanism, referred to as Access Control, shall allow to prevent selected classes of users from sending initial access messages for load control reasons. At subscription, one or more Access Classes are allocated to the subscriber and stored in the USIM [9], which are employed for this purpose.

5.3.1.1 Cell status and cell reservations

Cell status and cell reservations are indicated with the *Cell Access Restriction* Information Element in the System Information Message [4] by means of three Information Elements:

- Cell barred (IE type: "barred" or "not barred"),

- Cell Reserved for operator use (IE type: "reserved" or "not reserved"),

When cell status is indicated as "not barred", "not reserved" for operator use and "not reserved" for future extension (Cell Reservation Extension),

- the UE may select/re-select this cell during the cell selection and cell re-selection procedures in Idle mode and in Connected mode.

When cell status is indicated as "not barred", "not reserved" for operator use and "reserved" for future extension (Cell Reservation Extension),

- UEs shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status is indicated as "not barred" and "reserved" for operator use,

- UEs assigned to an Access Class in the range 11 to 15 may select/re-select this cell if in the home PLMN.

- UEs assigned to an Access Class in the range 0 to 9 shall behave as if cell status "barred" is indicated using the value "not allowed" in the IE "Intra-frequency cell re-selection indicator" and the maximum value for T_{barred}, see [4] (see also below).

When cell status "barred" is indicated,

- The UE is not permitted to select/re-select this cell, not even for emergency calls.

- The UE shall ignore the "Cell Reserved for future extension (Cell Reservation Extension) use" IE.

- The UE shall select another cell according to the following rule:

  - If the "Intra-frequency cell re-selection indicator" IE in Cell Access Restriction IE is set to value "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.

- If the UE is camping on another cell, the UE shall exclude the barred cell from the neighbouring cell list until the expiry of a time interval T_{barred}. The time interval T_{barred} is sent via system information in a barred cell together with Cell status information in the Cell Access Restriction IE.

- If the UE does not select another cell, and the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

- If the "Intra-frequency cell re-selection indicator" IE is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell. For emergency call, the Intra-frequency cell re-selection indicator IE" shall be ignored, i.e. even if it is set to "not allowed" the UE may select another intra-frequency cell.

- If the barred cell remains to be the "best" one, the UE shall after expiry of the time interval T_{barred} again check whether the status of the barred cell has changed.

5.3.1.2 Access Control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [4].

The UE shall ignore Access Class related cell access restrictions when selecting a cell to camp on, i.e. it shall not reject a cell for camping on because access on that cell is not allowed for any of the Access Classes of the UE. A change of the indicated access restriction shall not trigger cell re-selection by the UE.

Access Class related cell access restrictions shall be checked by the UE before sending an RRC CONNECTION REQUEST message when entering Connected Mode from UTRAN Idle mode. Cell access restrictions associated with the Access Classes shall not apply when the initial access for entering Connected Mode is triggered by an Inter-RAT cell re-selection to UTRAN, and for a UE which already is in Connected Mode.

5.3.1.3 Emergency Call

Emergency calls shall be allowed in all cells whose barred status is not barred, independent of restrictions due to cell reservations.

A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [4]. If access class 10 is indicated as barred in a cell, UEs with access class 0 to 9 or without an IMSI are not allowed to initiate emergency calls in this cell. For UEs with access classes 11 to 15, emergency calls are not allowed if both access class 10 and the relevant access class (11 to 15) are barred. Otherwise, emergency calls are allowed for those UEs.

Full details of operation under "Access class barred list" are described in [9].

5.3.2 GSM cells

The cell access restrictions applicable to GSM are specified in [1].