

ETSI TS 136 304 V8.4.0 (2009-01)

Technical Specification

**LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
User Equipment (UE) procedures in idle mode
(3GPP TS 36.304 version 8.4.0 Release 8)**



ReferenceRTS/TSGR-0236304v840

KeywordsLTE

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2009.
All rights reserved.

DECTTM, **PLUGTESTS**TM, **UMTS**TM, **TIPHON**TM, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPPTM is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

LTETM is a Trade Mark of ETSI currently being registered

for the benefit of its Members and of the 3GPP Organizational Partners.

GSM[®] and the GSM logo are Trade Marks registered and owned by the GSM Association.

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Contents

Intellectual Property Rights	2
Foreword.....	2
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	7
3.1 Definitions	7
3.2 Symbols.....	8
3.3 Abbreviations	8
4 General description of Idle mode	9
4.1 Overview	9
4.2 Functional division between AS and NAS in Idle mode	10
4.3 Service types in Idle Mode	12
5 Process and procedure descriptions.....	13
5.1 PLMN selection.....	13
5.1.1 Void	13
5.1.2 Support for PLMN selection	13
5.1.2.1 General	13
5.1.2.2 E-UTRA case	13
5.1.2.3 UTRA case	14
5.1.2.4 GSM case	14
5.1.2.5 CDMA2000 case	14
5.2 Cell selection and reselection	14
5.2.1 Introduction.....	14
5.2.2 States and state transitions in Idle Mode.....	15
5.2.3 Cell Selection process.....	16
5.2.3.1 Description	16
5.2.3.2 Cell Selection Criteria	16
5.2.3.3 CSG cells in Cell Selection	16
5.2.3.4 GSM case in Cell Selection.....	17
5.2.3.5 UTRAN case in Cell Selection.....	17
5.2.4 Cell Reselection evaluation process.....	17
5.2.4.1 Reselection priorities handling.....	17
5.2.4.2 Measurement rules for cell re-selection	17
5.2.4.3 Mobility states of a UE	18
5.2.4.3.1 Scaling rules	18
5.2.4.4 Highest ranked cells with cell reservations, access restrictions or unsuitable for normal camping	19
5.2.4.5 E-UTRAN Inter-frequency and inter-RAT Cell Reselection criteria.....	19
5.2.4.6 Intra-frequency and equal priority inter-frequency Cell Reselection criteria.....	20
5.2.4.7 Cell reselection parameters in system information broadcasts.....	20
5.2.4.7.1 Speed dependant reselection parameters	22
5.2.4.8 Cell reselection with CSG cells.....	23
5.2.4.8.1 Cell reselection from a non-CSG cell to a CSG cell.....	23
5.2.4.8.2 Cell reselection from a CSG cell	23
5.2.5 Void	23
5.2.6 Camped Normally state	23
5.2.7 Cell Selection when leaving RRC_CONNECTED state	23
5.2.8 Any Cell Selection state.....	23
5.2.9 Camped on Any Cell state	24
5.3 Cell Reservations and Access Restrictions.....	24
5.3.1 Cell status and cell reservations	24
5.3.2 Access control.....	25
5.3.3 Emergency call	25

5.4	Tracking Area registration.....	25
6	Reception of broadcast information	25
6.1	Reception of system information.....	25
6.2	Void.....	26
7	Paging.....	26
7.1	Discontinuous Reception for paging	26
7.2	Subframe Patterns.....	26
Annex A (informative):	Void	28
Annex B (informative):	Change history	29
History		30

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the Access Stratum (AS) part of the Idle Mode procedures applicable to a UE. The non-access stratum (NAS) part of Idle mode procedures and processes is specified in [5].

The present document specifies the model for the functional division between the NAS and AS in a UE.

The present document applies to all UEs that support at least E-UTRA, including multi-RAT UEs as described in 3GPP specifications, in the following cases:

- When the UE is camped on an E-UTRA cell;
- When the UE is searching for a cell to camp on;

NOTE: When the UE is camped on or searching for a cell to camp on belonging to other RATs, the UE behaviour is described in the specifications of the other RAT.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 25.990: "Vocabulary for UTRAN".
- [2] 3GPP TS 36.300: "E-UTRA and E-UTRAN Overall Description; Stage 2".
- [3] 3GPP TS 36.331: "E-UTRA; Radio Resource Control (RRC) - Protocol Specification".
- [4] 3GPP TS 22.011: "Service accessibility".
- [5] 3GPP TS 23.122: "NAS functions related to Mobile Station (MS) in idle mode".
- [6] 3GPP TS 36.213: "E-UTRA; Physical layer procedures".
- [7] 3GPP TS 36.214: "E-UTRA; Physical layer; Measurements".
- [8] 3GPP TS 25.304: "User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode"
- [9] 3GPP TS 43.022: "Functions related to Mobile Station in idle mode and group receive mode".
- [10] 3GPP TS 36.133: "Requirements for Support of Radio Resource Management".
- [11] void
- [12] void
- [13] void
- [14] void
- [15] void

- [16] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3"
- [17] 3GPP2 C.S0024-A: "cdma2000 High Rate Packet Data Air Interface Specification".
- [18] 3GPP2 C.S0005-A: "Upper Layer (Layer 3) Signalling Standard for cdma2000 Spread Spectrum Systems".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions 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, but restriction as in 5.3.3 apply.

Allowed CSG list: A list stored in the USIM containing all the CSG identities of the CSGs to which the subscriber belongs.

Available PLMN(s): One or more PLMN(s) for which the UE has found at least one cell and read its PLMN identity(ies).

Barred Cell: A cell a UE is not allowed to camp on.

Camped on a cell: UE 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.

Closed Subscriber Group (CSG): A Closed Subscriber Group identifies subscribers of an operator who are permitted to access one or more cells of the PLMN but which have restricted access (CSG cells).

CSG cell: A CSG cell, part of the PLMN, broadcasting a specific CSG identity. A CSG cell is accessible by the members of the closed subscriber group for that CSG identity. All the CSG cells sharing the same CSG identity use the same radio access technology.

CSG identity: An identifier broadcast by a CSG cell or cells and used by the UE to facilitate access for authorised members of the associated Closed Subscriber Group.

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

EHPLMN: Any of the PLMN entries contained in the Equivalent HPLMN list [5].

Equivalent PLMN list: List of PLMNs considered as equivalent by the UE for 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 or the defined equivalent HPLMN (EHPLMN).

HNB Name: The Home eNodeB Name is a broadcast string in free text format that provides a human readable name for the Home eNodeB CSG identity.

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

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

Radio Access Technology: Type of technology used for radio access, for instance E-UTRA, UTRA, GSM, CDMA2000 1xEV-DO (HRPD) or CDMA2000 1x (1xRTT).

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

Registered PLMN: This is the PLMN on which certain Location Registration outcomes have occurred [5].

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.

Strongest cell: The cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure [6], [7].

Suitable Cell: This is a cell on which an UE may camp. For a E-UTRA cell, the criteria are defined in subclause 4.3, for a UTRA cell in [8], and for a GSM cell the criteria are defined in [9].

3.2 Symbols

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

<symbol> <Explanation>

3.3 Abbreviations

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

1xRTT	CDMA2000 1x Radio Transmission Technology
AS	Access Stratum
AC	Access Class (of the USIM)
BCCH	Broadcast Control Channel
CSG	Closed Subscriber Group
DRX	Discontinuous Reception
DL-SCH	Downlink Shared Channel
EHPLMN	Equivalent Home PLMN
EPC	Evolved Packet Core
EPS	Evolved Packet System
ETWS	Earthquake and Tsunami Warning System
E-UTRA	Evolved UMTS Terrestrial Radio Access
E-UTRAN	Evolved UMTS Terrestrial Radio Access Network
FDD	Frequency Division Duplex
GERAN	GSM/EDGE Radio Access Network
HPLMN	Home PLMN
HRPD	High Rate Packet Data
IMSI	International Mobile Subscriber Identity
MBMS	Multimedia Broadcast-Multicast Service
MCC	Mobile Country Code
MM	Mobility Management
MNC	Mobile Network Code
NAS	Non-Access Stratum
PLMN	Public Land Mobile Network
RAT	Radio Access Technology
RRC	Radio Resource Control
SAP	Service Access Point
SIBX	SystemInformationBlockTypeX
TDD	Time Division Duplex
UE	User Equipment
UMTS	Universal Mobile Telecommunications System

USIM	Universal Subscriber Identity Module
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

4 General description of Idle mode

4.1 Overview

The idle mode tasks can be subdivided into three processes:

- PLMN selection;
- Cell selection and reselection;
- Location registration.

The relationship between these processes is illustrated in Figure 1.

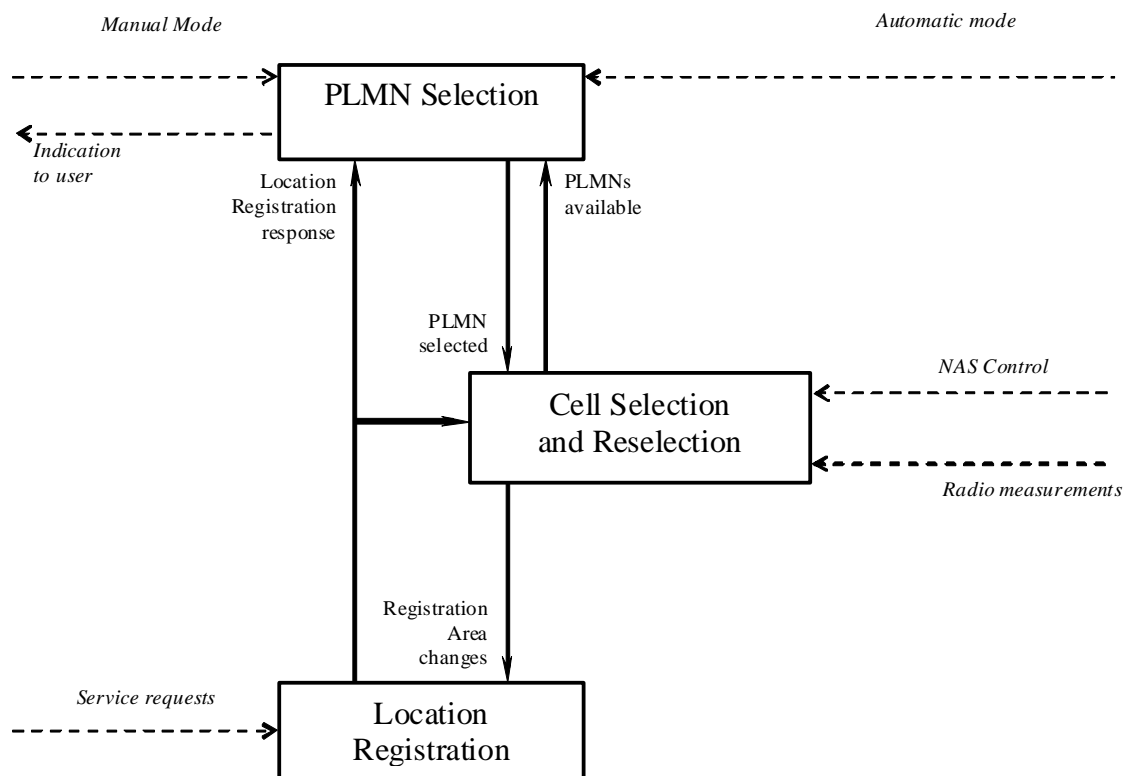


Figure 4.1-1: Overall Idle Mode process

When a UE is switched on, a public land mobile network (PLMN) is selected by NAS. For the selected PLMN, associated RAT(s) may be set [5]. The NAS shall provide a list of equivalent PLMNs, if available, that the AS shall use for cell selection and cell reselection.

With the cell selection, the UE searches for a suitable cell of the selected PLMN and chooses that cell to provide available services, further the UE shall tune 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 tracking area of the chosen cell and as outcome of a successful Location Registration the selected PLMN becomes the registered PLMN [5].

If the UE finds a more suitable cell, according to the cell reselection criteria, it reselects onto that cell and camps on it. If the new cell does not belong to at least one tracking area to which the UE is registered, location registration is performed.

If necessary, the UE shall search for higher priority PLMNs at regular time intervals as described in [4] and search for a suitable cell if another PLMN has been selected by NAS.

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 set of tracking areas in which the UE is camped. It can then send a "paging" message for the UE on the control channels of all the cells in this set of tracking areas. The UE will then receive the paging message because it is tuned to the control channel of a cell in one of the registered tracking areas and the UE can respond on that control channel.
- d) It enables the UE to receive ETWS notifications.

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 #12, 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.

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.

Idle Mode Process	UE Non-Access Stratum	UE Access Stratum
PLMN Selection	<p>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.</p> <p>Evaluate reports of available PLMNs from AS for PLMN selection.</p> <p>Maintain a list of equivalent PLMN identities.</p>	<p>Search for available PLMNs.</p> <p>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].</p> <p>Perform measurements to support PLMN selection.</p> <p>Synchronise to a broadcast channel to identify found PLMNs.</p> <p>Report available PLMNs with associated RAT(s) to NAS on request from NAS or autonomously.</p>
Cell Selection	<p>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 and CSG IDs on which the UE is allowed (Allowed CSG list) and provide this list to AS.</p>	<p>Perform measurements needed to support cell selection.</p> <p>Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS.</p> <p>Search for a suitable cell. The cells broadcast one or more 'PLMN identity' in the system information. Respond to NAS whether such cell is found or not.</p> <p>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].</p> <p>Check the broadcast CSG ID against the Allowed CSG list provided by NAS to check whether a CSG cell is suitable for the UE.</p> <p>If such a cell is found, the cell is selected to camp on.</p>
Cell Reselection	<p>Control cell reselection by for example, maintaining lists of forbidden registration areas.</p> <p>Maintain a list of equivalent PLMN identities and provide the list to AS.</p> <p>Maintain a list of forbidden registration areas and provide the list to AS.</p> <p>Maintain a list of CSG IDs on which the UE is allowed (Allowed CSG list) to camp and provide the list to AS.</p>	<p>Perform measurements needed to support cell reselection.</p> <p>Detect and synchronise to a broadcast channel. Receive and handle broadcast information. Forward NAS system information to NAS.</p> <p>Change cell if a more suitable cell is found.</p> <p>Check broadcasted CSG ID against the allowed CSG list provided by NAS to check whether a CSG cell is suitable for the UE.</p>
Location registration	<p>Register the UE as active after power on.</p> <p>Register the UE's presence in a registration area, for instance regularly or when entering a new tracking area.</p> <p>Maintain lists of forbidden registration areas .</p> <p>Deregister UE when shutting down.</p>	<p>Report registration area information to NAS.</p>

Idle Mode Process	UE Non-Access Stratum	UE Access Stratum
Support for manual CSG ID selection	Provide request to search for available CSG IDs. Evaluate reports of available CSG IDs from AS for CSG ID selection. Select a CSG ID and request AS to select a cell belonging to this CSG ID.	Search for available CSG IDs including the HNB name read from BCCH on SIB9. Report found CSG ID together with the HNB name to NAS. On selection of a CSG ID by NAS, select any cell belonging to the selected CSG ID fulfilling the cell selection criteria and not barred or reserved for operator use for UEs not belonging to AC 11 or 15 and give an indication to NAS that access is possible (for the registration procedure).

Table 4.2-1: Functional division between AS and NAS in idle mode

4.3 Service types 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:

- 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 E-UTRAN network:

- The cell is not barred, see subclause 5.3.1;
- The cell selection criteria are fulfilled, see subclause 5.2.3.2;

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 either:
 - the selected PLMN, or:
 - the registered PLMN, or:
 - a PLMN of the Equivalent PLMN list
 according to the latest information provided by NAS:
- The cell is not barred, see subclause 5.3.1;
- The cell is part of at least one TA that is not part of the list of "forbidden tracking areas for roaming" [4], which belongs to a PLMN that fulfils the first bullet above;
- The cell selection criteria are fulfilled, see subclause 5.2.3.2;
- For a cell identified as CSG cell by system information, the CSG ID is part of the allowed CSG list of the UE.

If more than one PLMN identity is broadcast in the cell, the cell is considered to be part of all TAs with TAIs constructed from the PLMN identities and the TAC broadcast in the cell.

barred cell:

A cell is barred if it is so indicated in the system information [3].

reserved cell:

A cell is reserved if it is so indicated in system information [3].

Following exceptions to these definitions are applicable for UEs:

- camped on a cell that belongs to a registration area that is forbidden for regional provision of service; a cell that belongs to a registration area that is forbidden for regional provision service ([5], [16]) is suitable but provides only limited service.
- as an outcome of the manual CSG ID selection procedure the UE is allowed to access an acceptable cell which fulfils the cell selection criteria and is not barred or reserved for operator use for UEs not belonging to AC 11 or 15 and inform NAS that access is possible (for location registration procedure).

NOTE: UE is not required to support manual search and selection of CSG IDs while in RRC CONNECTED state.

5 Process and procedure descriptions

5.1 PLMN selection

In the UE, the AS shall report available PLMNs to the NAS on request from the NAS or autonomously.

During PLMN selection, based on the list of PLMN identities in priority order, the particular PLMN may be selected either automatically or manually. Each PLMN in the list of PLMN identities is identified by a 'PLMN identity'. In the system information on the broadcast channel, the UE can receive one or multiple 'PLMN identity' in a given cell. The result of the PLMN selection performed by NAS (see 3GPP TS 23.122 [5]) is an identifier of the selected PLMN.

5.1.1 Void

5.1.2 Support for PLMN selection

5.1.2.1 General

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

5.1.2.2 E-UTRA case

The UE shall scan all RF channels in the E-UTRA bands according to its capabilities to find available PLMNs. On each carrier, the UE shall search for the strongest cell and read its system information, in order to find out which PLMN(s) the cell belongs to. If the UE can read one or several PLMN identities in the strongest cell, each found PLMN (see the PLMN reading in [3]) shall be reported to the NAS as a high quality PLMN (but without the RSRP value), provided that the following high quality criterion is fulfilled:

1. For an E-UTRAN cell, the measured RSRP value shall be greater than or equal to -110 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 RSRP value. The quality measure reported by the UE to NAS shall be the same for each PLMN found in one cell.

The search for PLMNs may be stopped on request of the NAS. The UE may optimise PLMN search by using stored information e.g. carrier frequencies and optionally also information on cell parameters 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 UTRA case

Support for PLMN selection in UTRA is described in [8].

5.1.2.4 GSM case

Support for PLMN selection in GERAN is described in [9].

5.1.2.5 CDMA2000 case

For CDMA2000 the network determination for HRPD and 1xRTT is described in [17] and [18] respectively.

5.2 Cell selection and reselection

5.2.1 Introduction

UE shall perform measurements for cell selection and reselection purposes as specified in [10].

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 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].

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

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

- Receive system information from the PLMN; and
 - receive registration area information from the PLMN, e.g., tracking area information; and
 - receive other AS and NAS Information; and
- if registered:
 - receive paging and notification messages from the PLMN; and
 - initiate transfer to connected mode.

5.2.2 States and state transitions and procedures in RRC_IDLE

Figure 2 shows the states and state transitions and procedures in RRC_IDLE. Whenever a new PLMN selection is performed, it causes an exit to number 1.

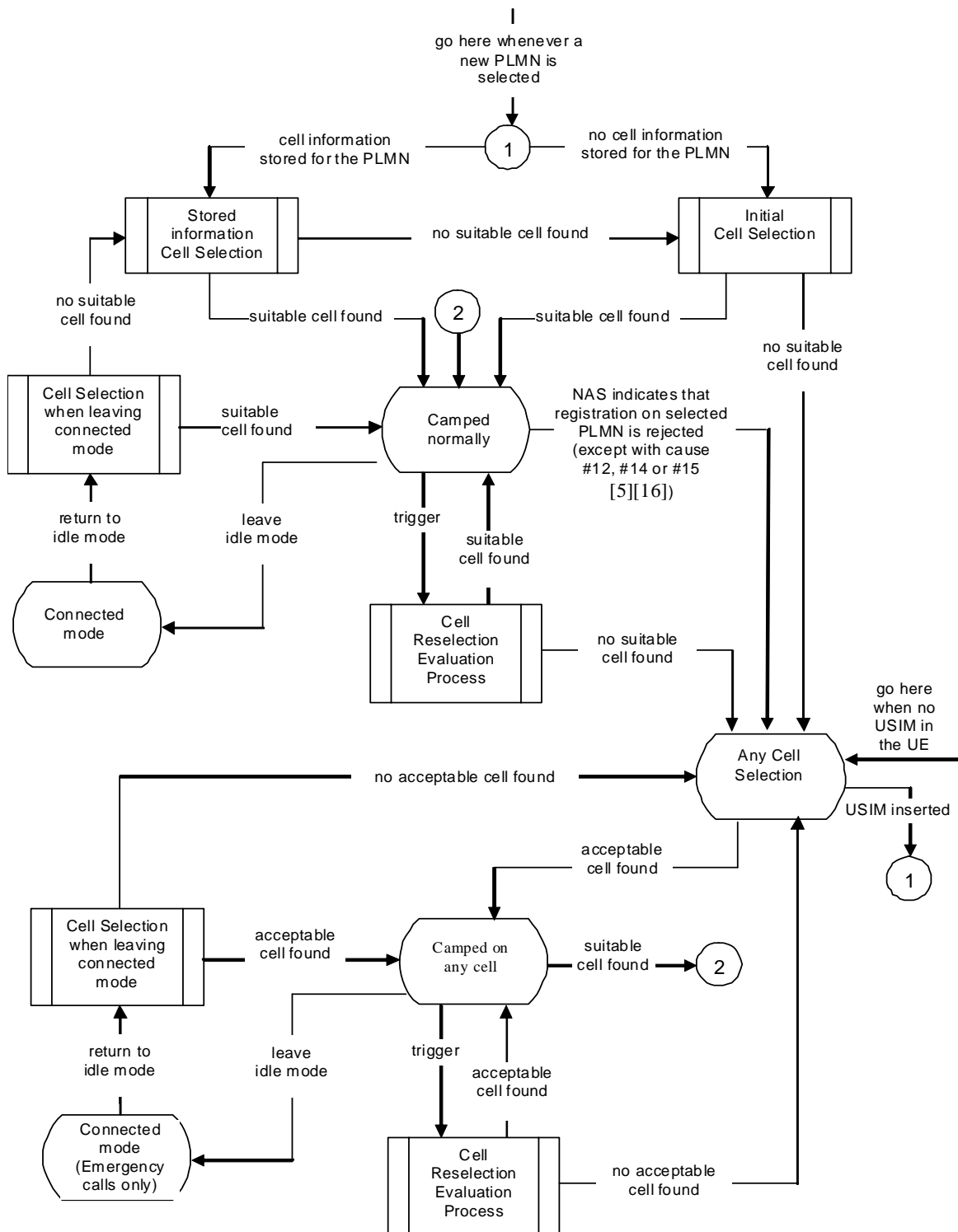


Figure 5.2.2-1: RRC_IDLE Cell Selection and Reselection

5.2.3 Cell Selection process

5.2.3.1 Description

The UE shall use one of the following two cell selection procedures:

a) Initial Cell Selection

This procedure requires no prior knowledge of which RF channels are E-UTRA carriers. The UE shall scan all RF channels in the E-UTRA bands according to its capabilities to find a suitable cell. On each carrier frequency, 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, from previously received measurement control information elements or from previously detected cells. Once the UE has found a suitable cell the UE shall select it. If no suitable cell is found the Initial Cell Selection procedure shall be started.

NOTE: Priorities between different frequencies or RATs provided to the UE by system information or dedicated signalling are not used in the cell selection process.

5.2.3.2 Cell Selection Criteria

The cell selection criterion S is fulfilled when:

$$S_{rxlev} > 0$$

Where:

$$S_{rxlev} = Q_{rxlevmeas} - (Q_{rxlevmin} + Q_{rxlevminoffset}) - P_{compensation}$$

Where:

the signalled value $Q_{rxlevminOffset}$ is only applied when a cell is evaluated for cell selection as a result of a periodic search for a higher priority PLMN while camped normally in a VPLMN [5]. During this periodic search for higher priority PLMN the UE may check the S criteria of a cell using parameter values stored from a different cell of this higher priority PLMN.

S_{rxlev}	Cell Selection RX level value (dB)
$Q_{rxlevmeas}$	Measured cell RX level value (RSRP).
$Q_{rxlevmin}$	Minimum required RX level in the cell (dBm)
$Q_{rxlevminoffset}$	Offset to the signalled $Q_{rxlevmin}$ taken into account in the S_{rxlev} evaluation as a result of a periodic search for a higher priority PLMN while camped normally in a VPLMN [5]
$P_{compensation}$	$\max(p_{max} - \text{UE Maximum Output Power}, 0)$ (dB)
p_{max}	Maximum TX power level an UE may use when transmitting on the uplink in the cell (dBm)
UE Maximum Output Power	Maximum RF output power of the UE (dBm) [TS 36.101]

5.2.3.3 CSG cells in Cell Selection

In addition to normal cell selection rules a manual selection of CSG IDs shall be supported by the UE upon request from higher layers as defined in subclause 5.5.

5.2.3.4 GSM case in Cell Selection

The cell selection criteria and procedures in GSM are specified in [9].

5.2.3.5 UTRAN case in Cell Selection

The cell selection criteria and procedures in UTRAN are specified in [8].

5.2.4 Cell Reselection evaluation process

5.2.4.1 Reselection priorities handling

Absolute priorities of different E-UTRAN frequencies or inter-RAT frequencies may be provided to the UE in the system information or in the RRC message releasing the RRC connection. If priorities are assigned via dedicated signalling, the UE shall ignore all the priorities provided in system information. The UE shall delete priorities provided by dedicated signalling when:

- the UE enters RRC_CONNECTED state; or
- the optional validity time of dedicated priorities (T320) expires; or
- a PLMN selection is performed on request by NAS [5].

NOTE: Equal priorities between RATs are not supported.

UE shall only perform reselection evaluation for E-UTRAN frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided. UE shall not consider any black listed cells as candidate for reselection.

5.2.4.2 Measurement rules for cell re-selection

Following rules are used by the UE to limit needed measurements:

- If $S_{\text{intrasearch}}$ is sent in the serving cell and $S_{\text{ServingCell}} > S_{\text{intrasearch}}$, UE may choose to not perform intra-frequency measurements.
- If $S_{\text{ServingCell}} \leq S_{\text{intrasearch}}$, or $S_{\text{intrasearch}}$ is not sent in the serving cell UE shall perform intra-frequency measurements.
- The UE shall apply the following rules for E-UTRAN inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1:
 - o For an E-UTRAN inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current E-UTRA frequency the UE shall perform measurements of higher priority E-UTRAN inter-frequency or inter-RAT frequencies according to [10].
 - o For an E-UTRAN inter-frequency with an equal or lower reselection priority than the reselection priority of the current E-UTRA frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current E-UTRAN frequency:
 - If $S_{\text{nonintrasearch}}$ is sent in the serving cell and $S_{\text{ServingCell}} > S_{\text{nonintrasearch}}$ UE may choose not to perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority.
 - If $S_{\text{ServingCell}} \leq S_{\text{nonintrasearch}}$ or $S_{\text{nonintrasearch}}$ is not sent in the serving cell the UE shall perform measurements of E-UTRAN inter-frequencies or inter-RAT frequency cells of equal or lower priority according to [10].

Where $S_{\text{ServingCell}}$ is the S_{rxlev} -value of the serving cell.

5.2.4.3 Mobility states of a UE

Besides Normal-mobility state a High-mobility and a Medium-mobility state are applicable if the parameters (T_{CRmax} , N_{CR_H} , N_{CR_M} and $T_{CRmaxHyst}$) are sent in the system information broadcast of the serving cell.

State detection criteria:

Medium-mobility state criteria:

- If number of cell reselections during time period T_{CRmax} exceeds N_{CR_M} and not exceeds N_{CR_H}

High-mobility state criteria:

- If number of cell reselections during time period T_{CRmax} exceeds N_{CR_H}

The UE shall not count consecutive reselections between same two cells into mobility state detection criteria. if same cell is reselected just after one other reselection.

State transitions:

The UE shall:

- if the criteria for High-mobility state is detected:
 - enter High-mobility state.
- else if the criteria for Medium-mobility state is detected:
 - enter Medium-mobility state.
- else if criteria for either Medium- or High-mobility state is not detected during time period $T_{CRmaxHyst}$:
 - enter Normal-mobility state.

If the UE is in High- or Medium-mobility state, the UE shall apply the speed dependent scaling rules as defined in subclause 5.2.4.3.1.

5.2.4.3.1 Scaling rules

UE shall apply the following scaling rules:

- If neither Medium- nor Highmobility state is detected:
 - no scaling is applied.
- If High-mobility state is detected:
 - Multiply Q_{hyst} by the IE "Speed dependent ScalingFactor for Q_{hyst} for high mobility state' if sent on system information
 - For EUTRAN cells multiply $T_{reselection_{EUTRAN}}$ by the IE "Speed dependent ScalingFactor for $T_{reselection_{EUTRAN}}$ for high mobility state' if sent on system information
 - For UTRAN cells multiply $T_{reselection_{UTRAN}}$ by the IE "Speed dependent ScalingFactor for $T_{reselection_{UTRAN}}$ for high mobility state' if sent on system information
 - For GERAN cells multiply $T_{reselection_{GERAN}}$ by the IE "Speed dependent ScalingFactor for $T_{reselection_{GERAN}}$ for high mobility state' if sent on system information
 - For CDMA2000 HRPD cells Multiply $T_{reselection_{CDMA_HRPD}}$ by the IE "Speed dependent ScalingFactor for $T_{reselection_{CDMA_HRPD}}$ for high mobility state' if sent on system information
 - For CDMA2000 1xRTT cells Multiply $T_{reselection_{CDMA_1xRTT}}$ by the IE "Speed dependent ScalingFactor for $T_{reselection_{CDMA_1xRTT}}$ for high mobility state' if sent on system information

- For HRPD cells multiply $Treselection_{CDMA-HRPD}$ by the IE "Speed dependent ScalingFactor for $Treselection_{CDMA-HRPD}$ for high mobility state" if sent on system information.
- For 1xRTT cells multiply $Treselection_{OneXRTT}$ by the IE "Speed dependent ScalingFactor for $Treselection_{OneXRTT}$ for high mobility state" if sent on system information.
- If Medium-mobility state is detected:
 - Multiply Q_{hyst} by the IE "Speed dependent ScalingFactor for Q_{hyst} for medium mobility state' if sent on system information
 - For EUTRAN cells multiply $Treselection_{EUTRAN}$ by the IE "Speed dependent ScalingFactor for $Treselection_{EUTRAN}$ for medium mobility state' if sent on system information
 - For UTRAN cells multiply $Treselection_{UTRAN}$ by the IE "Speed dependent ScalingFactor for $Treselection_{UTRAN}$ for medium mobility state' if sent on system information
 - For GERAN cells multiply $Treselection_{GERAN}$ by the IE "Speed dependent ScalingFactor for $Treselection_{GERAN}$ for medium mobility state' if sent on system information
 - For CDMA2000 HRPD cells Multiply $Treselection_{CDMA_HRPD}$ by the IE "Speed dependent ScalingFactor for $Treselection_{CDMA_HRPD}$ for medium mobility state' if sent on system information
 - For CDMA2000 1xRTT cells Multiply $Treselection_{CDMA_1xRTT}$ by the IE "Speed dependent ScalingFactor for $Treselection_{CDMA_1xRTT}$ for medium mobility state' if sent on system information
 - For HRPD cells multiply $Treselection_{CDMA-HRPD}$ by the IE 'Speed dependent ScalingFactor for $Treselection_{CDMA-HRPD}$ for medium mobility state' if sent on system information.
 - For 1xRTT cells multiply $Treselection_{OneXRTT}$ by the IE 'Speed dependent ScalingFactor for $Treselection_{OneXRTT}$ for medium mobility state' if sent on system information.

In case scaling is applied to any $Treselection_{RAT}$ parameter the UE shall round up the result after all scalings to the nearest second.

5.2.4.4 Highest ranked cells with cell reservations, access restrictions or unsuitable for normal camping

For the highest ranked cell (including serving cell) according to cell reselection criteria specified in subclause 5.2.3.4, the UE shall check if the access is restricted according to the rules in subclause 5.3.1.

If that cell and other cells have to be excluded from the candidate list, as stated in subclause 5.3.1, the UE shall not consider these as candidates for cell reselection. This limitation is removed when the highest ranked cell changes.

If the highest ranked cell is an intra-frequency or inter-frequency cell which is not suitable due to being part of the "list of forbidden TAs for roaming" or belonging to a PLMN which is not indicated as being equivalent to the registered PLMN, the UE shall not consider this cell and other cells on the same frequency, as candidates for reselection for a maximum of 300s. If the UE has to perform an *any cell selection* procedure any limitation shall be removed.

If the highest ranked cell is an inter-RAT cell which is not suitable due to being part of the "list of forbidden TAs for roaming" or belonging to a PLMN which is not indicated as being equivalent to the registered PLMN, the UE shall not consider this cell as a candidate for reselection for a maximum of 300s. In case of UTRA further requirements are defined in the [8]. If the UE has to perform an *any cell selection* procedure any limitation shall be removed.

5.2.4.5 E-UTRAN Inter-frequency and inter-RAT Cell Reselection criteria

Criteria 1: the $S_{nonServingCell,x}$ of a cell on evaluated frequency is greater than $Thresh_{x,high}$ during a time interval $Treselection_{RAT}$;

Cell reselection to a cell on a higher priority E-UTRAN frequency or inter-RAT frequency than serving frequency shall be performed if:

- A cell of a higher priority E-UTRAN frequency or inter-RAT frequency fulfils criteria 1; and
- more than 1 second has elapsed since the UE camped on the current serving cell.

Cell reselection to a cell on a lower priority E-UTRAN frequency or inter-RAT frequency than serving frequency shall be performed if:

- No cell on serving frequency or on an equal priority E-UTRAN frequency or on a higher priority E-UTRAN frequency or inter-RAT frequency than serving frequency fulfills the criteria 1; and
- $S_{\text{ServingCell}} < \text{Thresh}_{\text{serv, low}}$ and the $S_{\text{nonServingCell},x}$ of a cell of a lower priority E-UTRAN frequency or inter-RAT frequency is greater than $\text{Thresh}_{x, \text{low}}$ during a time interval $\text{Treselection}_{\text{RAT}}$; and
- more than 1 second has elapsed since the UE camped on the current serving cell.

Cell reselection to a cell on an equal priority E-UTRAN frequency shall be based on ranking for Intra-frequency Cell Reselection as defined in sub-clause 5.2.4.6.

For GERAN, UTRAN, and E-UTRAN, $S_{\text{nonServingCell},x}$ is the S_{rxlev} -value of an evaluated cell. For cdma2000 RATs, $S_{\text{nonServingCell},x}$ is equal to $\text{FLOOR}(-2 \times 10 \times \log_{10} E_c/I_o)$ in units of 0.5 db, as defined in [18], with E_c/I_o referring to the value measured from the evaluated cell.

In all the above criteria the value of $\text{Treselection}_{\text{RAT}}$ is scaled when the UE is in the medium or high mobility state as defined in subclause 5.2.4.3.1. If more than one cell meets the above criteria, the UE shall reselect a cell ranked as the best cell among the cells meeting the criteria on the highest priority frequencies or the highest priority RAT if the highest priority RAT is E-UTRA according to criteria defined in 5.2.4.6.

5.2.4.6 Intra-frequency and equal priority inter-frequency Cell Reselection criteria

The cell-ranking criterion R_s for serving cell and R_n for neighbouring cells is defined by:

$$R_s = Q_{\text{meas},s} + Q_{\text{Hyst}}$$

$$R_n = Q_{\text{meas},n} - Q_{\text{offset}}$$

where:

Q_{meas}	RSRP measurement quantity used in cell reselections.
Q_{offset}	For intra-frequency: Equals to $Q_{\text{offset},s,n}$, if $Q_{\text{offset},s,n}$ is valid, otherwise this equals to zero. For inter-frequency: Equals to $Q_{\text{offset},s,n}$ plus $Q_{\text{offset}_{\text{frequency}}}$, if $Q_{\text{offset},s,n}$ is valid, otherwise this equals to $Q_{\text{offset}_{\text{frequency}}}$.

The UE shall perform ranking of all cells that fulfill the cell selection criterion S , which is defined in 5.2.3.2

The cells shall be ranked according to the R criteria specified above, deriving $Q_{\text{meas},n}$ and $Q_{\text{meas},s}$ and calculating the R values using averaged RSRP results.

If a cell is ranked as the best cell the UE shall perform cell re-selection to that cell. If this cell is found to be not-suitable, the UE shall behave according to subclause 5.2.4.4.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better ranked than the serving cell during a time interval $\text{Treselection}_{\text{RAT}}$;
- more than 1 second has elapsed since the UE camped on the current serving cell.

5.2.4.7 Cell reselection parameters in system information broadcasts

Cell reselection parameters are broadcast in system information and are read from the serving cell as follows:

$Q_{\text{offset},s,n}$

This specifies the offset between the two cells.

$Q_{\text{offset}_{\text{frequency}}}$

Frequency specific offset for equal priority E-UTRAN frequencies.

Q_{hyst}

This specifies the hysteresis value for ranking criteria.

Q_{rxlevmin}

This specifies the minimum required Rx level in the cell in dBm.

$Treselection_{\text{RAT}}$

This specifies the cell reselection timer value. For each target frequency/frequency group per RAT a specific value for the cell reselection timer is defined, which is applicable when evaluating reselection within E-UTRAN or towards other RAT (i.e. $Treselection_{\text{RAT}}$ for E-UTRAN is $Treselection_{\text{EUTRAN}}$, for UTRAN $Treselection_{\text{UTRAN}}$ for GERAN $Treselection_{\text{GERAN}}$, for $Treselection_{\text{CDMA_HRPD}}$, and for $Treselection_{\text{CDMA_1xRTT}}$).

Note: $Treselection_{\text{RAT}}$ is not sent on system information, but used in reselection rules by the UE for each RAT.

$Treselection_{\text{EUTRAN}}$

This specifies the cell reselection timer value $Treselection_{\text{RAT}}$ for E-UTRAN. The parameter can be set per E-UTRAN frequency [3].

$Treselection_{\text{UTRAN}}$

This specifies the cell reselection timer value $Treselection_{\text{RAT}}$ for UTRAN.

$Treselection_{\text{GERAN}}$

This specifies the cell reselection timer value $Treselection_{\text{RAT}}$ for GERAN.

$Treselection_{\text{CDMA_HRPD}}$

This specifies the cell reselection timer value $Treselection_{\text{RAT}}$ for CDMA HRPD

$Treselection_{\text{CDMA_1xRTT}}$

This specifies the cell reselection timer value $Treselection_{\text{RAT}}$ for CDMA 1xRTT.

$Thresh_{x, \text{high}}$

This specifies the threshold used by the UE when reselecting towards the higher priority frequency X than current serving frequency. Each frequency of E-UTRAN and UTRAN, each group of GERAN frequencies, each band class of CDMA2000 HRPD and CDMA2000 1xRTT might have a specific threshold.

$Thresh_{x, \text{low}}$

This specifies the threshold used in reselection towards frequency X priority from a higher priority frequency. Each frequency of E-UTRAN and UTRAN, each group of GERAN frequencies, each band class of CDMA2000 HRPD and CDMA2000 1xRTT might have a specific threshold.

$Thresh_{\text{serving}, \text{low}}$

This specifies the threshold for serving frequency used in reselection evaluation towards lower priority E-UTRAN frequency or RAT.

$S_{\text{intra}}search$

This specifies the threshold (in dB) for intra-frequency measurements.

$S_{\text{nonintra}}search$

This specifies the threshold (in dB) for E-UTRAN inter-frequency and inter-RAT measurements.

5.2.4.7.1 Speed dependant reselection parameters

 T_{CRmax}

This specifies the duration for evaluating allowed amount of cell reselection(s).

 N_{CR_M}

This specifies the maximum number of cell reselections to enter Medium-mobility state.

 N_{CR_H}

This specifies the maximum number of cell reselections to enter High-mobility state.

 $T_{CRmaxHyst}$

This specifies the additional time period before the UE can enter Normal-mobility state.

Speed dependent ScalingFactor for Qhyst for High-mobility state

This specifies scaling factor for Qhyst in High-mobility state

Speed dependent ScalingFactor for Treselection_{EUTRAN} for High-mobility state

This specifies scaling factor for Treselection_{EUTRAN} in High-mobility state

Speed dependent ScalingFactor for Treselection_{UTRAN} for High-mobility state

This specifies scaling factor for Treselection_{UTRAN} in High-mobility state

Speed dependent ScalingFactor for Treselection_{GERAN} for High-mobility state

This specifies scaling factor for Treselection_{GERAN} in High-mobility state

Speed dependent ScalingFactor for Treselection_{CDMA_HRPD} for high mobility state

This specifies scaling factor for Treselection_{CDMA_HRPD} in high mobility state

Speed dependent ScalingFactor for Treselection_{CDMA_1xRTT} for high mobility state

This specifies scaling factor for Treselection_{CDMA_1xRTT} in high mobility state

Speed dependent ScalingFactor for Q_{hyst} for Medium-mobility state

This specifies scaling factor for Q_{hyst} in Medium-mobility state

Speed dependent ScalingFactor for Treselection_{EUTRAN} for Medium-mobility state

This specifies scaling factor for Treselection_{EUTRAN} in Medium-mobility state

Speed dependent ScalingFactor for Treselection_{UTRAN} for Medium-mobility state

This specifies scaling factor for Treselection_{UTRAN} in Medium-mobility state

Speed dependent ScalingFactor for Treselection_{GERAN} for Medium-mobility state

This specifies scaling factor for Treselection_{GERAN} in Medium-mobility state

Speed dependent ScalingFactor for Treselection_{CDMA_HRPD} for medium mobility state

This specifies scaling factor for Treselection_{CDMA_HRPD} in medium mobility state

Speed dependent ScalingFactor for Treselection_{CDMA_1xRTT} for medium mobility state

This specifies scaling factor for Treselection_{CDMA_1xRTT} in medium mobility state

5.2.4.8 Cell reselection with CSG cells

5.2.4.8.1 Cell reselection from a non-CSG cell to a CSG cell

In addition to normal cell reselection the UE shall use an autonomous search function for CSG cells when at least one CSG ID is included in the UE's allowed CSG list. This UE autonomous search for CSG cells may also include CSG cells of RATs other than E-UTRAN.

If the UE detects a suitable CSG cell it may reselect this cell irrespective of the cell reselection rules applicable for the cell the UE is currently camped on, if the concerned CSG cell is the highest ranked cell on that frequency.

Note: It is FFS if details of autonomous search functions are defined and what kind of requirements will be defined.

The UE shall disable the autonomous search function for CSG cells if the UE's allowed CSG list is empty.

Note: The need for a user selection of a CSG priority mode is FFS.

5.2.4.8.2 Cell reselection from a CSG cell

While camped on a suitable CSG cell, the UE shall apply the normal cell reselection rules as defined in subclause 5.2.4 and shall consider the frequency of the current cell to be the highest priority frequency (i.e. higher than the eight network configured values).

5.2.5 Void

5.2.6 Camped Normally state

When camped normally, the UE shall perform the following tasks:

- select and monitor the indicated Paging Channels of the cell as specified in clause 7 according to information sent in system information;
- monitor relevant System Information as specified in [3];
- perform necessary measurements for the cell reselection evaluation procedure;
- execute the cell reselection evaluation process on the following occasions/triggers:
 - 1) UE internal triggers, so as to meet performance as specified in [10];
 - 2) When information on the BCCH used for the cell reselection evaluation procedure has been modified.

5.2.7 Cell Selection when leaving RRC_CONNECTED state

On transition from RRC_CONNECTED to RRC_IDLE, a UE shall attempt to camp on the last cell for which it was in RRC_CONNECTED or any cell on a frequency or frequency of RAT assigned by RRC in the state transition message. If no suitable cell is found, the UE shall perform a cell selection starting with Stored Information Cell Selection procedure in order to find a suitable cell to camp on.

When returning to idle mode after UE moved to RRC_CONNECTED state from camped on any cell state, UE shall attempt to camp on the last cell for which it was in RRC_CONNECTED state or any cell on a frequency or frequency of RAT assigned by RRC in the state transition message. If no acceptable cell is found, the UE shall continue to search for an acceptable cell of any PLMN in state *any cell selection*.

5.2.8 Any Cell Selection state

In this state, the UE shall attempt to find an acceptable cell of any PLMN to camp on, trying all RATs that are supported by the UE and searching first for a high quality cell, as defined in subclause 5.1.2.2.

The UE, which is not camped on any cell, shall stay in this state until an acceptable cell is found.

5.2.9 Camped on Any Cell state

In this state, the UE shall perform the following tasks:

- select and monitor the indicated paging channels of the cell as specified in clause 7;
- monitor relevant System Information as specified in [3];
- perform necessary measurements for the cell reselection evaluation procedure;
- Execute the cell reselection evaluation process on the following occasions/triggers:
 - 1) UE internal triggers, so as to meet performance as specified in [10];
 - 2) When information on the BCCH used for the cell reselection evaluation procedure has been modified;
- regularly attempt to find a suitable cell trying all frequencies of all RATs that are supported by the UE. If a suitable cell is found, UE shall move to camped normally state;
- if the UE supports CS voice services, the UE should select an acceptable cell of any supported RAT which provides access to the CS domain.

5.3 Cell Reservations and Access Restrictions

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 [4], which are employed for this purpose.

5.3.1 Cell status and cell reservations

Cell status and cell reservations are indicated in the *SystemInformationBlockType1* [3] by means of two Information Elements:

- *cellBarred* (IE type: "barred" or "not barred")
In case of multiple PLMNs indicated in SIB1, this IE is common for all PLMNs
- *cellReservedForOperatorUse* (IE type: "reserved" or "not reserved")
In case of multiple PLMNs indicated in SIB1, this IE is specified per PLMN.

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

- All UEs shall treat this cell as candidate during the cell selection and cell re-selection procedures.

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

- UEs assigned to Access Class 11 or 15 operating in their HPLMN/EHPLMN shall treat this cell as candidate during the cell selection and reselection procedures if the IE *cellReservedForOperatorUse* for that PLMN set to 'reserved'.
- UEs assigned to an Access Class in the range of 0 to 9, 12 to 14 and UEs with AC 11 or 15 not operating in their HPLMN/EHPLMN shall behave as if the cell status is 'barred' in case the cell is 'reserved for operator use' for the PLMN the UE is currently registered with.

NOTE 1: ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN; ACs 12, 13, 14 are only valid for use in the home country [4].

When cell status "barred" is indicated or to be treated as if the cell status is "barred",

- The UE is not permitted to select/re-select this cell, not even for emergency calls.
- The UE shall select another cell according to the following rule:

- If the IE *intraFrequencyReselection* in IE *cellAccessRelatedInformation* in *SystemInformationBlockType1* is set to "allowed", the UE may select another cell on the same frequency if selection/re-selection criteria are fulfilled.
 - The UE shall exclude the barred cell as a candidate for cell selection/reselection until the expiry of the timer T_{barred} .
- If the IE *intraFrequencyReselection* in IE *cellAccessRelatedInformation* in *SystemInformationBlockType1* is set to "not allowed" the UE shall not re-select a cell on the same frequency as the barred cell.
 - The UE shall exclude the barred cell as a candidate for cell selection/reselection until the expiry of the timer T_{barred} .

If the IE *intraFrequencyReselection* has been read from a CSG cell it shall be ignored by the UE.

The cell selection of another cell may also include a change of RAT.

5.3.2 Access control

Information on cell access restrictions associated with the Access Classes is broadcast as system information, [3].

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 when starting RRC connection establishment procedure as specified in [3].

5.3.3 Emergency call

A restriction on emergency calls, if needed, shall be indicated in the "Access class barred list" IE [3]. 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 [4].

5.4 Tracking Area registration

In the UE, the AS shall report tracking area information to the NAS.

If the UE reads more than one PLMN identity in the current cell, the UE shall report the found PLMN identities that make the cell suitable in the tracking area information to NAS.

The non-access part of the location registration process is specified in [5].

Actions for the UE AS upon reception of Location Registration reject are specified in [4] and [16].

6 Reception of broadcast information

6.1 Reception of system information

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

UE shall monitor PCH as described in chapter 7.1 to received System Information change notifications in RRC_IDLE. Changes in the system information are indicated by the network using a *Paging* message. When the *Paging* message indicates system information changes then UE shall re-acquire all system information as specified in [3].

6.2 Void

7 Paging

7.1 Discontinuous Reception for paging

The UE may use Discontinuous Reception (DRX) in idle mode in order to reduce power consumption. One Paging Occasion (PO) is a subframe where there may be P-RNTI transmitted on PDCCH addressing the paging message. One Paging Frame (PF) is one Radio Frame, which may contain one or multiple Paging Occasion(s). When DRX is used the UE needs only to monitor one P-RNTI per DRX cycle.

PF and PO is determined by following formulae using the DRX parameters provided in System Information:

PF is given by following equation:

$$\text{SFN mod } T = (T \text{ div } N) * (\text{UE_ID mod } N)$$

Index i_s pointing to PO from subframe pattern defined in 7.2 will be derived from following calculation:

$$i_s = \text{floor}(\text{UE_ID}/N) \text{ mod } N_s$$

System Information DRX parameters stored in the UE shall be updated locally in the UE whenever the DRX parameter values are changed in SI. If the UE has no IMSI, for instance when making an emergency call without USIM, the UE shall use as default identity $\text{UE_ID} = 0$ in the PF and i_s formulas above.

The following Parameters are used for the calculation of the PF and i_s :

- T: Range of DRX values 32, 64, 128, 256 radio frames. The UE specific DRX parameter, if allocated and having shorter DRX than T, shall override T.
- nB: 4T, 2T, T, T/2, T/4, T/8, T/16, T/32.
- N: $\min(T, nB)$
- N_s : $\max(1, nB/T)$
- UE_ID: IMSI mod 1024.

IMSI is given as sequence of digits of type Integer (0..9), IMSI shall in the formulae above be interpreted as a decimal integer number, where the first digit given in the sequence represents the highest order digit.

For example:

$$\text{IMSI} = 12 \text{ (digit1=1, digit2=2)}$$

In the calculations, this shall be interpreted as the decimal integer "12", not " $1 \times 16 + 2 = 18$ ".

7.2 Subframe Patterns

FDD:

Ns	PO when $i_s=0$	PO when $i_s=1$	PO when $i_s=2$	PO when $i_s=3$
1	9	N/A	N/A	N/A
2	4	9	N/A	N/A
4	0	4	5	9

TDD (all UL/DL patterns):

Ns	PO when i_s=0	PO when i_s=1	PO when i_s=2	PO when i_s=3
1	0	N/A	N/A	N/A
2	0	5	N/A	N/A
4	0	1	5	6

Annex A (informative):
Void

Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2007-06					Agreed text proposals from TSG RAN2#58bis meeting	0.0.0	0.0.1
2007-09	RP-37	RP-070687			Presented for information at TSG RAN-37	0.1.0	1.0.0
2007-11	RP-38	RP-070915			Presented for approval at TSG RAN-38	1.2.0	2.0.0
	RP-38	-			Approved at TSG RAN-38 and placed under change control	2.0.0	8.0.0
2008-03	RP-39	RP-080193	0001	1	CR to 36.304 on Miscellaneous corrections	8.0.0	8.1.0
2008-05	RP-40	RP-080408	0002	-	Add RAT specific Treselection parameters for CDMA HRPD and 1xRTT	8.1.0	8.2.0
	RP-40	RP-080408	0003	1	Paging Subframe Patterns for FDD and TDD and paging parameters clarification	8.1.0	8.2.0
	RP-40	RP-080408	0004	1	Editorial corrections to 36.304	8.1.0	8.2.0
	RP-40	RP-080408	0005	-	PLMN selection ping-pong control	8.1.0	8.2.0
2008-09	RP-41	RP-080689	0006	1	CR on Considerations on various open items in 36.304	8.2.0	8.3.0
	RP-41	RP-080689	0007	1	CSG related correction to 36.304	8.2.0	8.3.0
	RP-41	RP-080689	0008	1	Clarification of the medium mobility state criteria	8.2.0	8.3.0
	RP-41	RP-080689	0009	-	Support for Manual CSG ID Selection	8.2.0	8.3.0
	RP-41	RP-080689	0010	-	USIM less paging occasion calculation	8.2.0	8.3.0
	RP-41	RP-080689	0013	1	Definition of Qoffset in cell reselection criteria	8.2.0	8.3.0
	RP-41	RP-080689	0017	-	Correction to Discontinuous Reception for paging	8.2.0	8.3.0
	RP-41	RP-080689	0018	-	Lifetime of dedicated cell reselection priorities	8.2.0	8.3.0
	RP-41	RP-080689	0019	-	Clarification on cell reselection parameters	8.2.0	8.3.0
2008-12	RP-42	RP-081017	0020	1	Correcting the UE behaviour when Sintrasearch and Snointrasearch are not provided	8.3.0	8.4.0
	RP-42	RP-081017	0021	-	Proposed CR to 36.304 [Rel-8] on Definition of	8.3.0	8.4.0
	RP-42	RP-081017	0022	1	Proposed CR to 36.304 [Rel-8] on Intra-frequency reselection allowed/not-allowed concept	8.3.0	8.4.0
	RP-42	RP-081017	0023	-	Proposed CR to 36.304 [Rel-8] on Introduction of Pcompensation	8.3.0	8.4.0
	RP-42	RP-081017	0024	-	Proposed CR to 36.304 [Rel-8] on Support of UE autonomous search for E-UTRAN CSG cells when camped on other RAT than E-UTRAN	8.3.0	8.4.0
	RP-42	RP-081017	0025	-	Correction to range of nB in TS 36.304	8.3.0	8.4.0
	RP-42	RP-081017	0026	2	Miscellaneous corrections to 36.304	8.3.0	8.4.0
	RP-42	RP-081017	0027	1	Proposed CR to 36.304 [Rel-8] on Support of registration procedures as outcome of a manual CSG ID selection	8.3.0	8.4.0
	RP-42	RP-081017	0029	2	Implicit priority for CSG cells	8.3.0	8.4.0
	RP-42	RP-081017	0032	-	Correction of the reselection formula for offset used for PLMN selection	8.3.0	8.4.0
	RP-42	RP-081017	0036	-	Clarification of definition of SnonServingCell,x for cdma2000 RATs in TS 36.304	8.3.0	8.4.0
	RP-42	RP-081017	0038	1	Support of emergency calls in LTE Rel-8	8.3.0	8.4.0
	RP-42	RP-081017	0042	-	CR to 36.304 on Removal of cellReservationExtension	8.3.0	8.4.0
	RP-42	RP-081017	0044	1	Idle mode agreements related to 36.304	8.3.0	8.4.0

History

Document history		
V8.2.0	November 2008	Publication
V8.3.0	November 2008	Publication
V8.4.0	January 2009	Publication