



**5G;  
NR;**

**User Equipment (UE) procedures in idle mode  
and in RRC Inactive state  
(3GPP TS 38.304 version 15.6.0 Release 15)**



---

Reference

RTS/TSGR-0238304vf60

---

Keywords

---

5G

**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**

---

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

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

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

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

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2020.

All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

**3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

**oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

**GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

## Intellectual Property Rights

### Essential patents

IPRs essential or potentially essential to normative deliverables 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 (<https://ipr.etsi.org/>).

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.

### Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

---

## Legal Notice

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. These shall be interpreted as being references to the corresponding ETSI deliverables.

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

---

## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

# Contents

Intellectual Property Rights .....	2
Legal Notice .....	2
Modal verbs terminology.....	2
Foreword.....	5
1 Scope .....	6
2 References .....	6
3 Definitions, symbols and abbreviations .....	7
3.1 Definitions .....	7
3.2 Abbreviations .....	7
4 General description of RRC_IDLE state and RRC_INACTIVE state .....	8
4.1 Overview .....	8
4.2 Functional division between AS and NAS in RRC_IDLE state and RRC_INACTIVE state .....	9
4.3 Service types in RRC_IDLE state .....	12
4.4 Service types in RRC_INACTIVE state .....	12
4.5 Cell Categories .....	12
5 Process and procedure descriptions.....	13
5.1 PLMN selection.....	13
5.1.1 Support for PLMN selection.....	13
5.1.1.1 General .....	13
5.1.1.2 NR case .....	13
5.1.1.3 E-UTRA case .....	13
5.2 Cell selection and reselection .....	13
5.2.1 Introduction.....	13
5.2.2 States and state transitions in RRC_IDLE state and RRC_INACTIVE state .....	15
5.2.3 Cell Selection process .....	16
5.2.3.1 Description .....	16
5.2.3.2 Cell Selection Criterion.....	16
5.2.3.3 E-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 .....	18
5.2.4.3 Mobility states of a UE .....	19
5.2.4.3.0 Introduction .....	19
5.2.4.3.1 Scaling rules .....	19
5.2.4.4 Cells with cell reservations, access restrictions or unsuitable for normal camping.....	20
5.2.4.5 NR Inter-frequency and inter-RAT Cell Reselection criteria.....	20
5.2.4.6 Intra-frequency and equal priority inter-frequency Cell Reselection criteria.....	21
5.2.4.7 Cell reselection parameters in system information broadcasts.....	21
5.2.4.7.0 General reselection parameters.....	21
5.2.4.7.1 Speed dependent reselection parameters .....	23
5.2.4.8 Inter-RAT Cell reselection in RRC_INACTIVE state .....	24
5.2.5 Camped Normally state .....	24
5.2.6 Selection of cell at transition to RRC_IDLE or RRC_INACTIVE state .....	24
5.2.7 Any Cell Selection state.....	25
5.2.8 Camped on Any Cell state .....	25
5.3 Cell Reservations and Access Restrictions.....	25
5.3.0 Introduction.....	25
5.3.1 Cell status and cell reservations .....	25
5.3.2 Unified access control.....	26
5.4 Tracking Area registration.....	26
5.5 RAN Area registration.....	27
6 Reception of broadcast information .....	27

6.1 Reception of system information.....27

7 Paging.....27

7.1 Discontinuous Reception for paging .....27

**Annex A (informative): Change history .....29**

History .....31

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3f1e17d0-6e0d-4591-9e42-15d1d99d92f6/etsi-ts-138-304-v15.6.0-2020-01>

---

# 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.

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3f1e17d0-6e0d-4591-9e42-15d1d99d92f6/etsi-ts-138-304-v15.6.0-2020-01>

---

# 1 Scope

The present document specifies the Access Stratum (AS) part of the UE procedures in RRC\_IDLE state (also called Idle mode) and RRC\_INACTIVE state. The non-access stratum (NAS) part of Idle mode procedures and processes is specified in TS 23.122 [9].

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 NR Radio Access, including multi-RAT UEs as described in 3GPP specifications, in the following cases:

- When the UE is camped on a NR 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 RATs.

---

# 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 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 38.300: "NR Overall Description; Stage 2".
- [3] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) - Protocol Specification".
- [4] 3GPP TS 38.213: "NR; Physical layer procedures for control".
- [5] Void
- [6] 3GPP TS 36.331: "E-UTRA; Radio Resource Control (RRC) - Protocol Specification".
- [7] 3GPP TS 36.304: "E-UTRA; User Equipment (UE) procedures in RRC\_IDLE state".
- [8] 3GPP TS 38.133: "NR; Requirements for Support of Radio Resource Management".
- [9] 3GPP TS 23.122: "NAS functions related to Mobile Station (MS) in RRC\_IDLE state".
- [10] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [11] 3GPP TS 38.215: "NR; Physical layer measurements".
- [12] 3GPP TS 22.261: "Service requirements for the 5G system".
- [13] 3GPP TS 24.890: "5G System – Phase 1; CT WG1 Aspects".
- [14] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [15] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

## 3 Definitions, symbols 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 4.5.

**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.

**Commercial Mobile Alert System:** Public Warning System that delivers *Warning Notifications* provided by *Warning Notification Providers* to CMAS capable UEs.

**EHPLMN:** Any of the PLMN entries contained in the Equivalent HPLMN list TS 23.122 [9].

**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.

**Process:** A local action in the UE invoked by an RRC procedure or an RRC\_IDLE or RRC\_INACTIVE state procedure.

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

**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.

**Registered PLMN:** This is the PLMN on which certain Location Registration outcomes have occurred, as specified in TS 23.122 [9].

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

**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 frequency that is considered strongest according to the layer 1 cell search procedure (TS 38.213 [4], TS 38.215 [11]).

**Suitable Cell:** This is a cell on which a UE may camp. For NR cell, the criteria are defined in clause 4.5, for E-UTRA cell in TS 36.304 [7].

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AS	Access Stratum
CMAS	Commercial Mobile Alert System
CN	Core Network

DCI	Downlink Control Information
ETWS	Earthquake and Tsunami Warning System
E-UTRA	Evolved UMTS Terrestrial Radio Access
E-UTRAN	Evolved UMTS Terrestrial Radio Access Network
IMSI	International Mobile Subscriber Identity
MCC	Mobile Country Code
MICO	Mobile Initiated Connection Only
NAS	Non-Access Stratum
NR	NR Radio Access
PLMN	Public Land Mobile Network
RAT	Radio Access Technology
RNA	RAN-based Notification Area
RNAU	RAN-based Notification Area Update
RRC	Radio Resource Control
UAC	Unified Access Control
UE	User Equipment
UMTS	Universal Mobile Telecommunications System

## 4 General description of RRC\_IDLE state and RRC\_INACTIVE state

### 4.1 Overview

The RRC\_IDLE state and RRC\_INACTIVE state tasks can be subdivided into three processes:

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

PLMN selection, cell reselection procedures, and location registration are common for both RRC\_IDLE state and RRC\_INACTIVE state. RNA update is only applicable for RRC\_INACTIVE state. When UE selects a new PLMN, UE transitions from RRC\_INACTIVE to RRC\_IDLE, as specified in TS 24.501 [14].

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, as specified in TS 23.122 [9]. The NAS shall provide a list of equivalent PLMNs, if available, that the AS shall use for cell selection and cell reselection.

With cell selection, the UE searches for a suitable cell of the selected PLMN, chooses that cell to provide available services, and monitors its control channel. This procedure is defined as "camping on the cell".

The UE shall, if necessary, then register its presence, by means of a NAS registration procedure, in the tracking area of the chosen cell. As an outcome of a successful Location Registration, the selected PLMN then becomes the registered PLMN, as specified in TS 23.122 [9].

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. In RRC\_INACTIVE state, if the new cell does not belong to the configured RNA, an RNA update procedure is performed.

If necessary, the UE shall search for higher priority PLMNs at regular time intervals as described in TS 23.122 [9] 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 available PLMNs is given to the user so that a manual selection can be performed (manual mode).

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

The purpose of camping on a cell in RRC\_IDLE state and RRC\_INACTIVE state 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 or resume a suspended 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 network needs to send a message or deliver data to the registered UE, it knows (in most cases) the set of tracking areas (in RRC\_IDLE state) or RNA (in RRC\_INACTIVE state) 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 the corresponding set of areas. The UE will then receive the paging message and can respond.
- d) It enables the UE to receive ETWS and CMAS notifications.

When the UE is in RRC\_IDLE state, upper layers may deactivate AS layer when MICO mode is activated as specified in TS 24.501 [14]. When MICO mode is activated, the AS configuration (e.g. priorities provided by dedicated signalling) is kept and all running timers continue to run but the UE need not perform any idle mode tasks. If a timer expires while MICO mode is activated it is up to the UE implementation whether it performs the corresponding action immediately or the latest when MICO mode is deactivated. When MICO mode is deactivated, the UE shall perform all idle mode tasks.

## 4.2 Functional division between AS and NAS in RRC\_IDLE state and RRC\_INACTIVE state

Table 4.2-1 presents the functional division between UE non-access stratum (NAS) and UE access stratum (AS) in RRC\_IDLE state and RRC\_INACTIVE states. The NAS part is specified in TS 23.122 [9] and the AS part in the present document.

**PREVIEW**  
iTech STANDARD PREVIEW  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3f1e17db-3134-4591-9e42-15d1d99d92f6/etsi-ts-138-304-v15.6.0-2020-01>

Table 4.2-1: Functional division between AS and NAS in RRC\_IDLE state and RRC\_INACTIVE state

**ITeH STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3f1e17d0-6e0d-4591-9e42-15d1d99d92f6/etsi-ts-138-304-v15.6.0-2020-01>