Technical Document

RRGRR MSC

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Important Notice

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[ISO 9000:2000] International Organization for Standardization. Quality management systems - Fundamentals and vocabulary. December 2000

1 Introduction

This document describes the interactions of the GPRS RR(GRR) and the GSM RR entities in order to support
a Mobile Station which supports the GPRS service.

The next sections give a overview of some GPRS principles and differences between GPRS and GSM. It also gives some definitions of terms used throughout this document.

1.1 GPRS Design Principles

GPRS adds a packet-switched service to the already existing circuit switched services in GSM. GPRS is designed for small packets which are send often and periodically and for discontinous transmission of middle-sized packets. In addition to this, GPRS allows each user to specifiy the Quality of Service (QoS) class (by bying it) which control the parameters of the packet transmission.

The resources in a cell are limited and a cell has to support packet and circuit switched services. because of the nature of packet transfr, which is very dynamic, it is possible that there is a lot of GPRS traffic going on at one moment and near to nothing in another moment. In order to handle these constraints GPRS uses the Capacity-on-Demand principle.

A cell supporting GPRS does not need to have GPRS radio resources allocated at a given instance. If no GPRS radio resources are allocated, an MS can request allocation of such resources. MSs may then use these radio resources. The PLMN may dynamically increase, to a PLMN operator-defined maximum, or, decrease to an operator-defined minimum, the radio resources allocated. Those physical channels (i.e. PDCHs), shared by the GPRS MSs, are taken from the common pool of physical channels available in the cell. The allocation of physical channels to circuit switched services and GPRS is done dynamically. The allocation of capacity for GPRS can be based on the needs for actual packet transfers. The operator can, as well, decide to dedicate permanently or temporarily some physical resources (i.e. PDCHs) for the GPRS traffic. The network broadcasts GPRS system information on the common control channels. GSM radio resources are dynamically shared between GPRS and other GSM services.

1.2 GPRS MM States

This section is mostly for completeness but also affects some RR procedures. In GPRS MM is in one of the following states: IDLE, STANDBY, READY. IDLE corresponds to the GSM MM "not registered" state in which the MS is not yet registered in the network. STANDBY corresponds to the GSM MM IDLE, NORMAL SERVICE state which is reached after a successfull registration. The READY state has no corresondence to a MM state. It is entered at the beginning of a connection and maintained for some time after the connection has been released. This is done in order to minimize the paging load on the network because a lot more short connections are established to support small, bursty packet traffic.

IDLE State

In GPRS IDLE state, the subscriber is not attached to the GPRS mobility management. The MS and SGSN context hold no valid location or routeing information for the subscriber. PLMN selection and GPRS cell selection and re-selection processes are performed by the MS. In order to establish MM contexts in the MS and the SGSN, the MS shall perform the GPRS Attach procedure.

STANDBY State

In STANDBY state, the subscriber is attached to GPRS mobility management. The MS and SGSN have established MM contexts for the subscriber's IMSI. The MS may receive PTM-M and PTM-G data. Pages for PTP or PTM-G data or signalling information transfers may be received. It is also possible to receive pages for the CS services via the SGSN. PTP data reception and transmission, and PTM-G data transmission, are not possible in this state.

The MS performs GPRS Routeing Area (RA) and GPRS cell selection and re-selection locally. The MS executes mobility management procedures to inform the SGSN when it has entered a new RA. The MS does not inform the SGSN on a change of cell in the same RA. Therefore, the location information in the SGSN MM context contains only the GPRS RAI for MSs in STANDBY state.
The MS may initiate activation or deactivation of PDP contexts while in STANDBY state. A PDP context shall be activated before data can be transmitted or received for this PDP context.
The SGSN may have to send data or signalling information to an MS in STANDBY state. The SGSN then sends a Paging Request in the routeing area where the MS is located if PPF is set. If PPF is cleared, then paging is not done. The MM state in the MS is changed to READY when the MS responds to the page, and in the SGSN when the page response is received. Also, the MM state in the MS is changed to READY when data or signalling information is sent from the MS and, accordingly, the MM state in the SGSN is changed to READY when data or signalling information is received from the MS. The MS or the network may initiate the GPRS Detach procedure to move to the IDLE state. After expiry of the mobile reachable timer the SGSN may perform an implicit detach in order to return the MM contexts in the SGSN to IDLE state. The MM and PDP contexts may then be deleted.

READY State

In READY state, the SGSN MM context corresponds to the STANDBY MM context extended by location information for the subscriber on cell level. The MS performs mobility management procedures to provide the network with the actual selected cell. GPRS cell selection and re-selection is done locally by the MS, or may optionally be controlled by the network.
Regardless if a radio resource is allocated to the subscriber or not, the MM context remains in the READY state even when there is no data being communicated. The READY state is supervised by a timer. An MM context moves from READY state to STANDBY state when the READY timer expires. In order to move from READY state to IDLE state, the MS initiates the GPRS Detach procedure.

1.3 Channel Structure and Temporary Block Flow

The multiframe structure for PDCH consists of 52 TDMA frames (GSM has 51), divided into 12 RLC/MAC blockes (of 4 frames) on which the packet channels are mapped.

A Temporary Block Flow (TBF) is a physical connection used by the two RR entities to support the unidirectional transfer of LLC PDUs on packet data physical channels. The TBF is allocated radio resource on one or more PDCHs and comprise a number of RLC/MAC blocks carrying one or more LLC PDUs. A TBF is temporary and is maintained only for the duration of the data transfer.

1.4 GPRS Mobile Stations

A GPRS MS can operate in one of three modes of operation. The mode of operation depends on the services that the MS is attached to, i.e., only GPRS or both GPRS and other GSM services, and upon the MS's capabilities to operate GPRS and other GSM services simultaneously.

- Class-A mode of operation: The MS is attached to both GPRS and other GSM services, and the MS supports simultaneous operation of GPRS and other GSM services.
- Class-B mode of operation: The MS is attached to both GPRS and other GSM services, but the MS can only operate one set of services at a time.(A MS which favours GSM is called a class BC mobile, a MS favouring GPRS is a class BG mobile)
- Class-C mode of operation: The MS is exclusively attached to GPRS services.

1.5 Network Operation Modes

The network may provide co-ordination of paging for circuit-switched and packet-switched services. Paging co-ordination means that the network sends paging messages for circuit-switched services on the same channel as used for packet-switched services, i.e., on the GPRS paging channel or on the GPRS traffic channel, and the MS needs only to monitor that channel. Three network operation modes are defined.

- Network operation mode I: the network sends a CS paging message for a GPRS-attached MS, either on the same channel as the GPRS paging channel (i.e., the packet paging channel or the CCCH paging channel), or on a GPRS traffic channel. This means that the MS needs only to monitor one paging channel, and that it receives CS paging messages on the packet data channel when it has been assigned a packet data channel.
- Network operation mode II: the network sends a CS paging message for a GPRS-attached MS on the CCCH paging channel, and this channel is also used for GPRS paging. This means that the MS needs only to monitor the CCCH paging channel, but that CS paging continues on this paging channel even if the MS has been assigned a packet data channel.
- Network operation mode III: the network sends a CS paging message for a GPRS-attached MS on the CCCH paging channel, and sends a GPRS paging message on either the packet paging channel (if allocated in the cell) or on the CCCH paging channel. This means that an MS that wants to receive pages for both circuit-switched and packet-switched services shall monitor both paging channels if the packet paging channel is allocated in the cell. No paging co-ordination is performed by the network.

Additionally the presence of a PBCCH (which also can be allocated dynamically) affects the behaviour and procedures of the RR entity.

Paging Coordination Table:

NMO – the current network mode of the cell

PagCoord in PTM – in a R99 NW this can set in order to optimize the paging coordination for NM II and III in packet transfer mode

PBCCH – is a PBCCH available
State – current state of MS
CS paging – where to listen for CS pagings
PS paging – where to listen for PS pagings

NMO	PagCoord in PTM	PBCCH	State	CS Paging	PS Paging
I	x	PBCCH	PIM	PCCCH	PCCCH
I	x	BCCH	PIM	CCCH	CCCH
II	x	PBCCH	PIM	CCCH	CCCH
II	x	BCCH	PIM	CCCH	CCCH
III	x	PBCCH	PIM	CCCH	PCCCH
III	x	BCCH	PIM	CCCH	CCCH
I	y	PBCCH	PTM	PACCH	-
I	y	BCCH	PTM	PACCH	-
II	y	PBCCH	PTM	PACCH	-
II	y	BCCH	PTM	PACCH	-
II	n	PBCCH	PTM	CCCH	-
II	n	BCCH	PTM	CCCH	-
III	y	PBCCH	PTM	PACCH	-
III	y	BCCH	PTM	PACCH	-
III	n	PBCCH	PTM	CCCH	-
III	n	BCCH	PTM	CCCH	-

1.6 Radio Resource Management Overview

Radio Resource management prcoedures include the functionns related to the management of the common transmission resources, e.g. the physical channels and the data link connections on control channels. The general purpose of Radio Resource procedures is to establish, maintain and release RR connections that allow a oint-to-point dialogue between the network and a mobile station. If GPRS point-to-point services are supported, the radio resource management procedures include functions related to the management of transmission resources on packet data physical channels. Moreover, Radio Resource management procedures include reception of the uni-directional BCCH/CCCH and PBCCH/PCCCH data when no RR connection is established. Additionally procedures for cell selection/reselection and the handover procedures are used.

RR can be in the following states: IDLE, DEDICATED, PACKET IDLE, PACKET TRANSFER, CELL SELECTION in which different procedures are possible or running:

The aim of the idle mode processes it to achieve the following conditions ("normal service state"):

a) The registered PLMN is the selected PLMN

b) The MS is camped on a suitable cell of the registration area on which the last successful LR was performed, and that cell has the highest value of C2 for any unbarred cell in that registration area.

Instead of the parameters C2, a GPRS MS applies the corresponding GPRS parameters if provided.

There may be temporary conditions under which not all these are fully satisfied, e.g., during cell selection on a PLMN or while in the process of reselectiong another cell. However, if the above cannot be satisfied for a certain period of time, the MS will normally enter a "limited service state" in which it will try to camp on an acceptable cell. In this state, only emergency calls are possible.

1.6.1 Cell selection

The Mobile Station (MS) is choosing a suitable cell to camp on. This involves making measurements, synchronizing to a cell and reading its BCCH. If a cell is suitable the MS camps on this cell and enters the IDLE state.

1.6.2 Idle mode

The MS is camped on a cell (the serving cell), has no RR connection and waits for a connection request from the user or the network. The MS listens to its paging group and periodically checks the SIs of the current serving cell. It monitors the surrounding cells (neighbour cells) to assess if it is camping on the best possible cell. In order to make this decision the MS measures the radio propagation of the neighbour cells, synchronizes to the neighbour cells and read their SIs.

If the best possible cell is not the current cell the MS has to make a cell reselection. After synchronizing to the new cell, its full BCCH has to be read in order to read all parameters of the new cell. While reading the BCCH the MS also has to read the full CCCH in order to see a paging during cell reselection (the exact paging group is not known yet). After checking all parameters the MS enters the IDLE state.

When the MS is in IDLE state and receives a paging or MM requests a connection the MS is sending CHANNEL REQUEST messages on the Random Access Channel (RACH) and listens to the full BCCH and CCCH to receive a IMMEDIATE ASSIGNMENT message. After receiving a valid IMMEDIATE ASSIGNMENT the MS enters the contention resolution phase on the assigned dedicated channel. After the contention resolution the MS enters the DEDICATED state. XXX when the MS listens to ist paging goup on the CCCH it shall DSF XXX

1.6.3 Packet idle mode

Only applicable for mobile stations supporting GPRS. This mode includes part of the idle circuit switched mode functionality. The MS is camped on cell (the serving cell). It has no RR connection and no temporara block flow (TBF) exists and it waits for a connection request from the user or the network. This can either a packet-switched or a circuit-switched request. The MS listens to ist paging group on the PCCCH/CCCH and periodically reads the Sis/PSIs on the PBCCH/BCCH of the current serving cell. In PACKET IDLE state the MS monitors the neighbour cells to assess if it is camping on the best possible cell. In order to make this decision the MS measures the radio propagation of the neighbour cells and synchronizes to the neighbour cells. If the neighbourcell is not described in the PSIs received from the serving cell, the cell reselection information has to be read directly from the neighbour cells BCCH.

If the best possible cell is not the current cell the MS has to make a cell reselection to the best cell. The MS synchronizes to the new cell and reads the full PBCCH and/or BCCH in order to read all parameters. While reading the PBCCH/BCCH the MS also has to read the full PCCCH/CCCH in order to see a paging during cell reselection (the exact paging goup is not known yet). After checking all parameters the MS enters the PACKET IDLE state.

If a transfer of a LLC PDU is requested or the network pages the MS, the MS starts the packet access phase. The MS sends (PACKET) CHANNEL REQUEST messages on the PRACH/RACH and listens to the full BCCH and PCCH/CCCH (XXX check) to receive a (PACKET UPLINK/DOWNLIK) (IMMEDIATE) ASSIGNMENT message. After receiving a valid ASSIGNMENT the MS enters the contention resolution phase on the assigned channel. When the MS is in PACKET IDLE state and in READY state it can also receive a DOWNLINK ASSIGNMENT directly on its paging group. Then the MS enters directly the contention resolution phase after having switched to the assigned channel. After the contention resolution the MS enters the PACKET TRANSFER state.

For a MS in PACKET IDLE state the network can control the cell reselection and the reporting of measurements by a NETWORK CONTROL ORDER, which indicates the degree of control the network wants to have. If the NETWORK CONTROL ORDER is not used (it is 0) the MS follows the procedures above. Otherwise the network may request measurements by the MS and/or control to which cell the MS reselects.

1.6.4 Dedicated mode

In the DEDICATED state, the MS has an active RR connection over which signalling data can be send. In order to maintain this connection several procedures are possible on RR level:

- measurement report (sacch procedures)
- intracell change (channel assignment)
- intercell change (handover)
- frequency redifinition
- channel mode modify
- cipher mode setting
- additional channel assignment
- classmark procedures
- channel release procedures
- rr status
- configuration change

The MS has to make measurements on the neighbour cells and send these result to he BSS. This is used by the network to control the HANDOVER decision.

Additionally the following procedures can be initiated by the netowrk for GPRS: PDHC ASSIGNMENT COMMAND, CELL CHANGE ORDER, GPRS SUSPSENSION and RR INITILISATION REQUEST.

on release of the dediceted channel, the MS XXXX

1.6.5 Packet transfer mode

Only applicable for mobile stations supporting GPRS. In packet transfer mode, the mobile station is allocated a radio resource providing a temporary block flow (TBF) on one or more packet data channels over which RLC/MAC blocks can be transmitted.

The MS periodically reads the PSIs on the PACCH of the current serving cell and in failure caes also of the PBCCH/BCCH. In PACKET TRANSFER state the MS monitors the neighbour cells to assess if it is camping o the best possible cell. In order to make this decision the MS measures the radio propagation of the neighbour cells and sysnchronzes to the neighbour cells. If the neighbourcell is not described in the PSIs received frmo the serving cell , the cell reselection information has to be read directly from the neighbour cells BCCH.

It the best possible cell is not the current cell the MS has to make a cell reselection to the best cell. The MS temporarily leaves the PACKET TRANSFER state and enters PACKET IDLE state to synchronize to the new cell and read the full BCCH and/or PBCCH in order to read all parameters. While reading the BCCH/PBCCH the MS also has to read the full CCCH/PCCCH in order to see a paging during cell reselection (the exact paging group is not known yet). After checking all parameters the MS re-enters the PACKET TRANSFER state.

For a MS in PACKET TRANSFER state the netowrk can control the cell reselection adn the reportiing of measurements by a NETWORK CONTROL ORDER, which indicates the degree of cotnrol the networkr wants to have. If the NETWORK CONTROL ORDER is not used (it is 0) the MS follows the procedures above. Otherwise the network may request measurements by the MS and/or control to which cell the MS reselects.

If the MS is in PACKET TRANSFER state it can receive a paging for a circuit-switched connection on the PCCCH, in which caes the MS has to leave the PACKET TRANSFER state.

1.7 Analysis of GPRS support in RR

This section describes the differences between the states of RR when GPRS is supported and when it is not supported. It also lists all modified and additional procedures necessary for GPRS.

1.7.1 Tasks of RR and GRR

GRR handles all procedures for packet-switched channels (PxxCH) and RR handles all proceduress relating to circuit-switched channels (xxCH). If information is received which is specific and/or new to GPRS it is processed by GRR (there are some execptions). It is also possible that some procedures relating to GPRS include sub-procedures which are handled by RR (all, in the case of no PBCCH) . The communication between RR and GRR is done via the primitive interface but will later be changed to a functional interface. Message decoding is done twice, in RR and GRR, for some messages, this has to be optimized via a shared memory mechanism later on.

1.7.2 Differences of procedures between RR for a cell with GPRS support and without

IDLE_BCCH: The cell reselect decision and initiation is done by RR.

IDLE_PBCCH: RR only does neighbour cell synchronization for GRR. GRR makes the cell reselection decision and intiation. Additionally GRR can request establishment of a circuit-switched connection.

PTM_PBCCH: RR only does neighbour cell synchronisation for GRR.

PTM_BCCH: Depending on the Network Control Order RR has to do different tasks:

NC0: Neighbour cell synchronization and bcch reading and c2 calculation.

NC1: Neighbour cell synchronization and bcch reading and c2 calculation. RR also has to inform GRR of the BSIC of the neighbour cell.

NC2: Neighbour cell synchronization. RR also has to inform GRR of the BSIC of the neighbour cell.

GRR should only indicate deviations from normal GSM behaviour to RR.(packet access/no CCCH listening etc.), not things which are normally done by RR.

The following procedures have to be handled by RR with regard to GPRS:

- [A] no CS paging listening on CCCH in idle mode
- [B] no Packet paging listening on CCCH in idle mode
- [C] Packet access on CCCH (stops A/B)
- [D] CS call with GPRS suspension/resumption
- [E] CS call indication to GRR
- [F] CS call indicaton from GRR
- [G] BCCH acquisition according to CHANGE_MARK in idle mode
- Dedicated mode RR commands relating to GPRS (used in every combination - omitted from table)

These procedures have to be used according to the table below:

Table 1: Necessary Procedures for RR

	Net mode I		Net mode II	Net mode III	
	BCCH	PBCCH	BCCH	PBCCH	BCCH
	CCCH	PCCCH/PDCH		P/CCCH	CCCH
Class A	E,C,G	A,B,F,G	C,E,G	(B),E,G	C,E,G
Class B	C,D,E,G	A,B,C,D,F,G	C,D,E,G	B,C,D,E,G	C,D,E,G
Class C	C,G	A,B,G	C,G	A,B,G	C,G

2 Procedures

2.1 Cell Selection Procedure

MM can request either:

- Full Search,
- Limited Serach or
- Net(PLMN) Search.

In addition to this G23 information MM also provides the information if the MS supports GPRS.

The result of this request can be either:

- Full Service,
- Limited Service,
- No Service.

In addition to these G23 results a suitable cell can also support GPRS services and when it does it will support a specific net mode(handled by GRR/GMM), it may also have a PBCCH or not.

The Cell Selection procedure are exactly the same as for a G23 MS. The only difference is that, if GPRS support is indicated from MM and a cell supporting GPRS is found, GRR is informed about this(only in Full Service). According to the net mode of this cell and the mobile class the handling of idle mode is differentiated.

The Cell Selection procedures are described in 03.22 and 05.08.

2.1.1 Full Service/GPRS activated/ Cell supports GPRS on BCCH

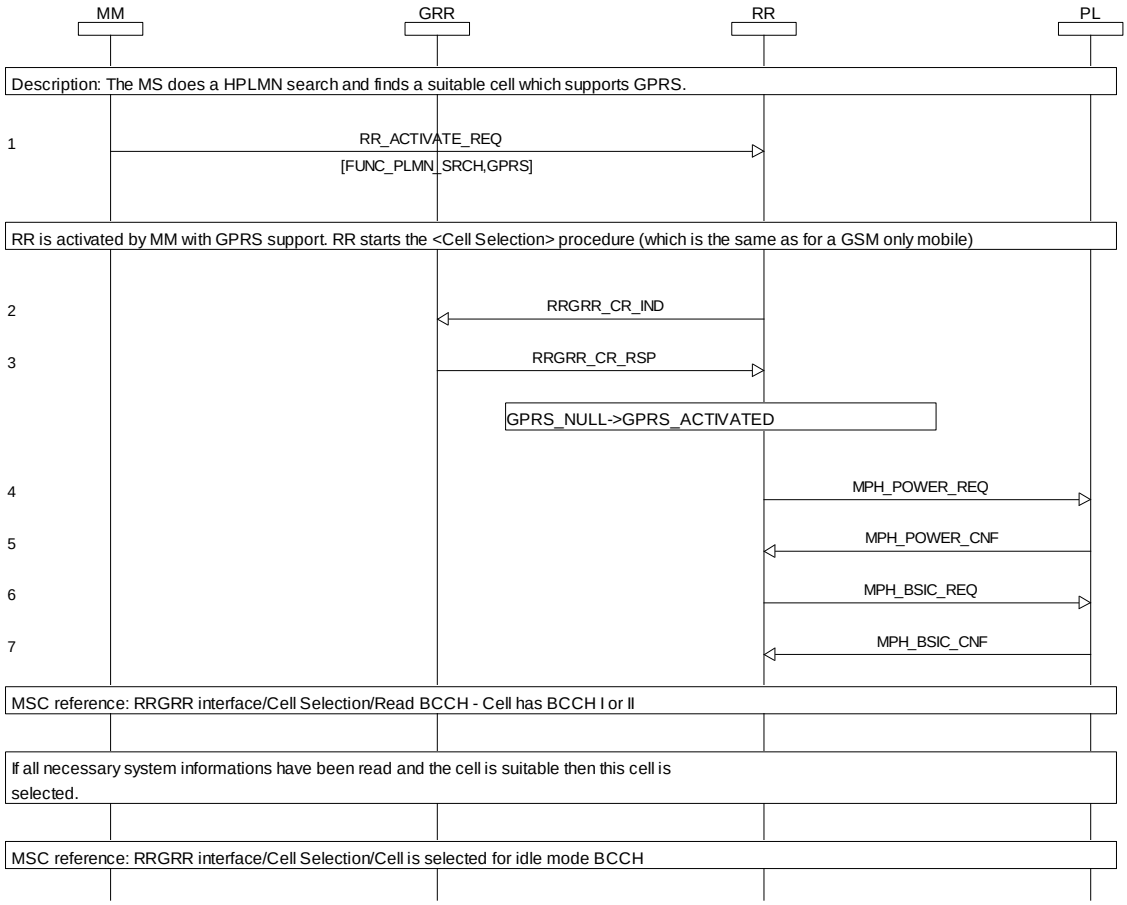


Figure 1: Full Service/GPRS activated/ Cell supports GPRS on BCCH

2.1.2 Read BCCH - Cell has BCCH I

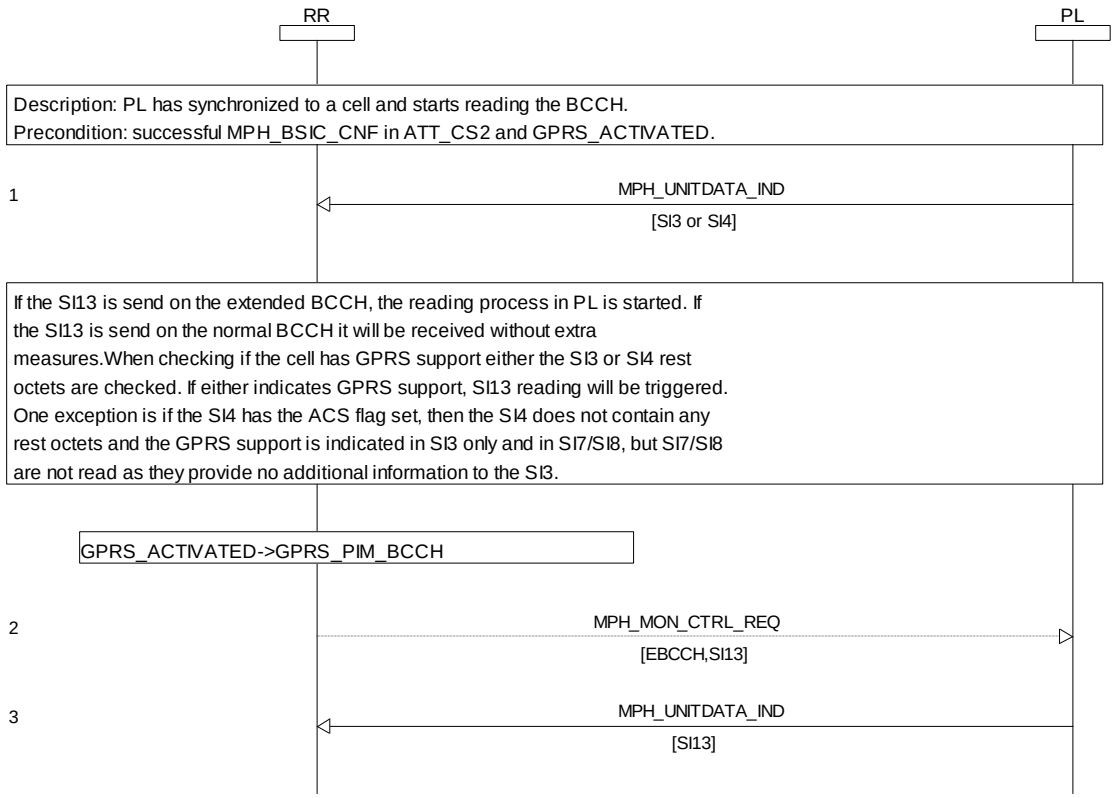


Figure 2 Read BCCH - Cell has BCCH I

2.1.3 Read BCCH - Cell has BCCH II

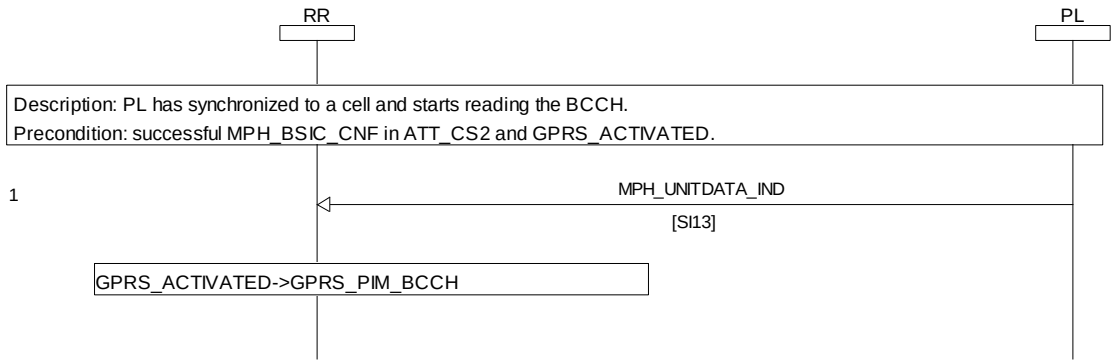


Figure 3 Read BCCH - Cell has BCCH II

2.1.4 Enter Idle Mode on BCCH

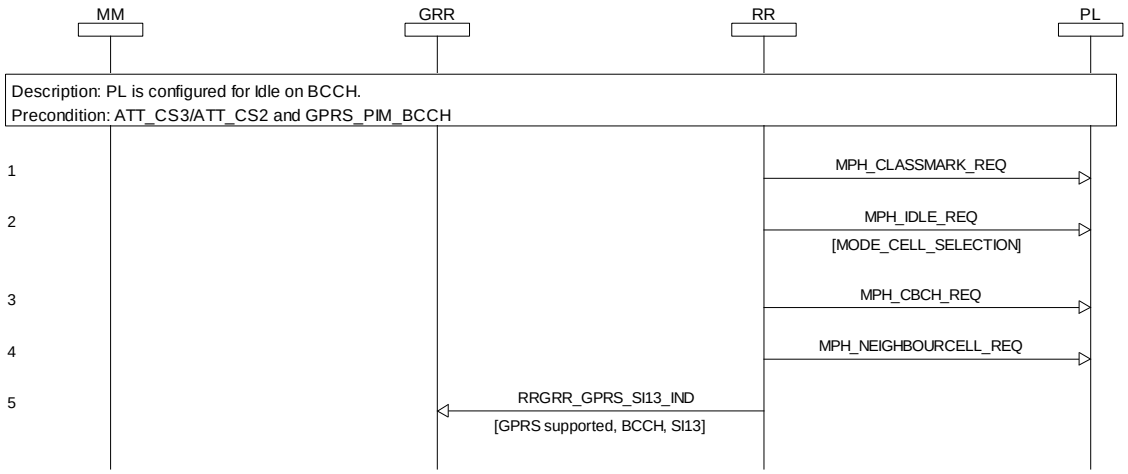


Figure 4 Enter Idle Mode on BCCH

2.1.5 Cell is selected for idle mode BCCH - Full service

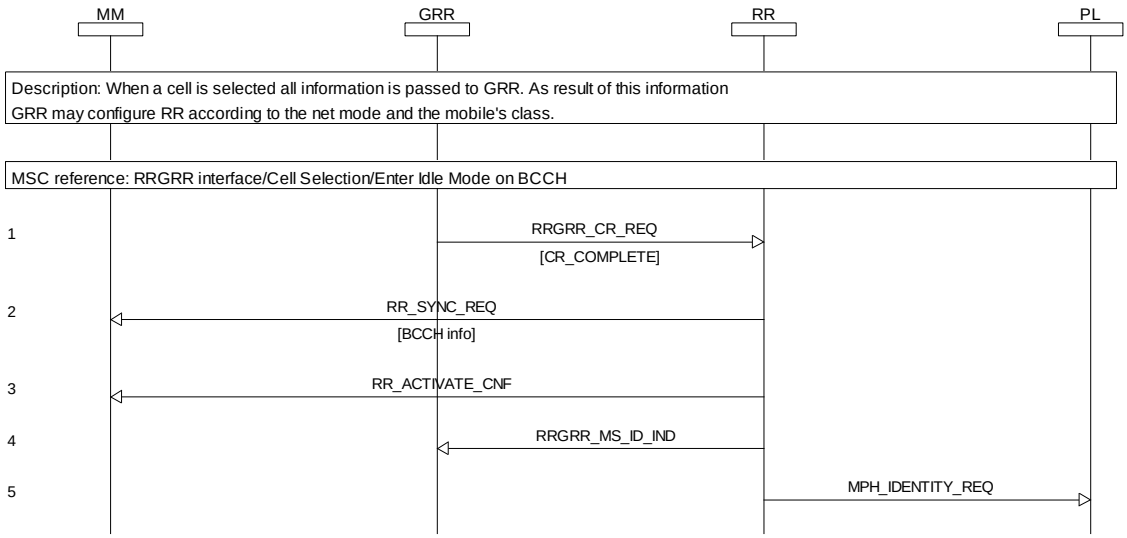


Figure 5 Cell is selected for idle mode BCCH - Full service

2.1.6 Full Service/GPRS activated/ Cell supports GPRS on PBCCH

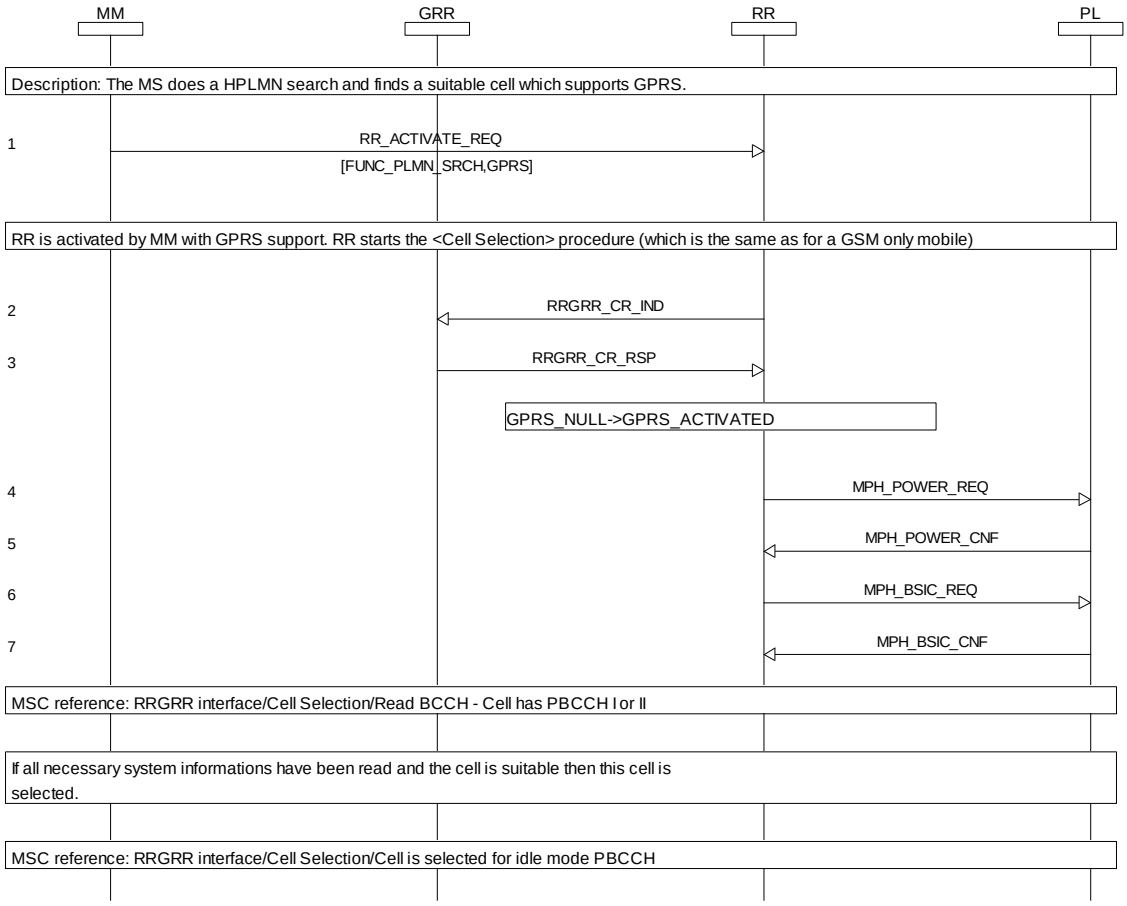


Figure 6 Full Service/GPRS activated/ Cell supports GPRS on PBCCH

2.1.7 Read BCCH - Cell has PBCCH I

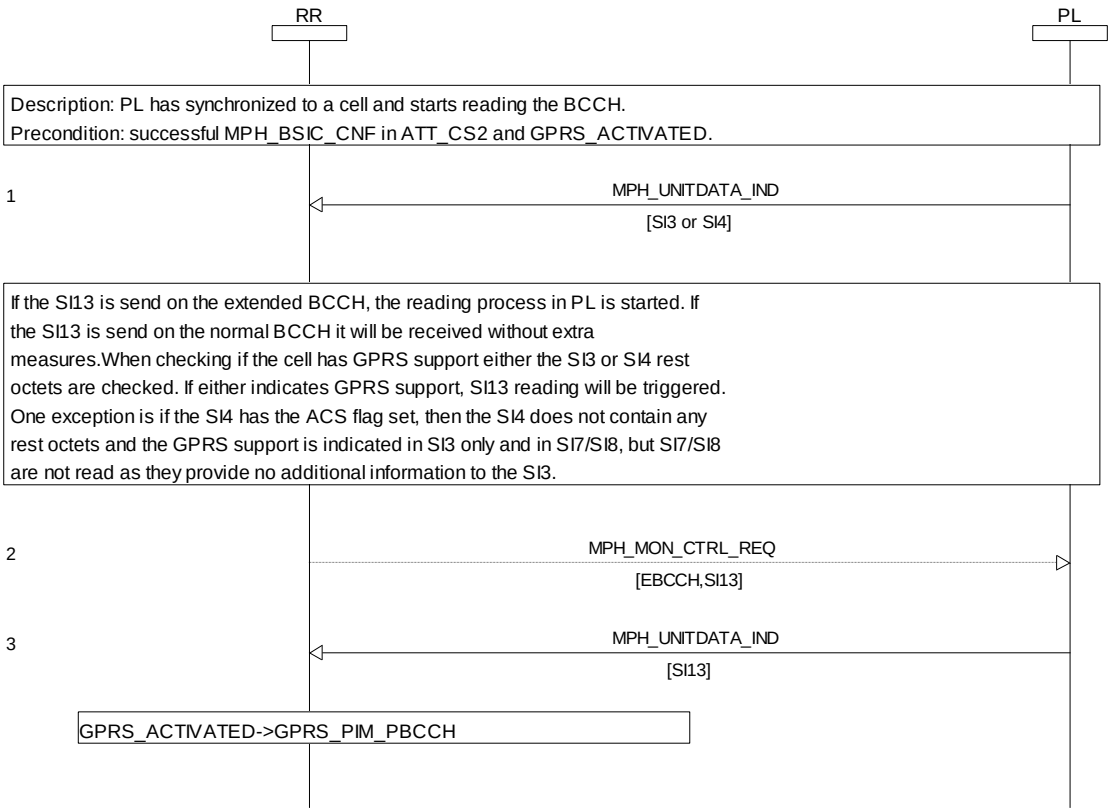


Figure 7 Read BCCH - Cell has PBCCH I

2.1.8 Read BCCH - Cell has PBCCH II

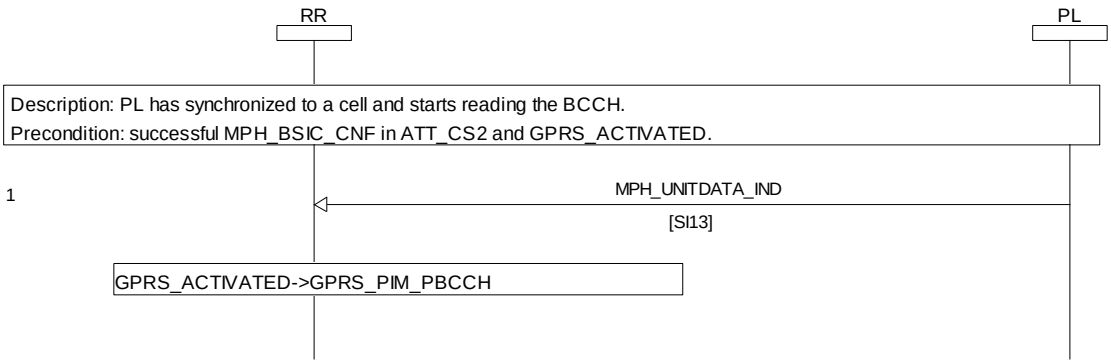


Figure 8 Read BCCH - Cell has PBCCH II

2.1.9 Enter Idle Mode on PBCCH

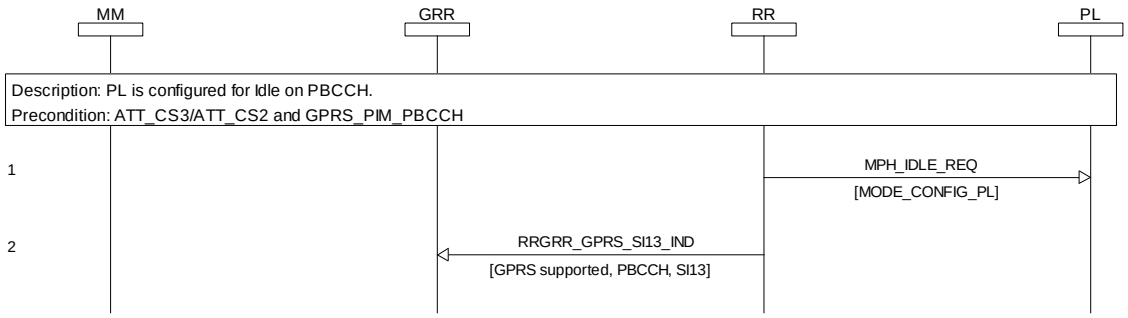


Figure 9 Enter Idle Mode on PBCCH

2.1.10 Cell is selected for idle mode PBCCH - Full service

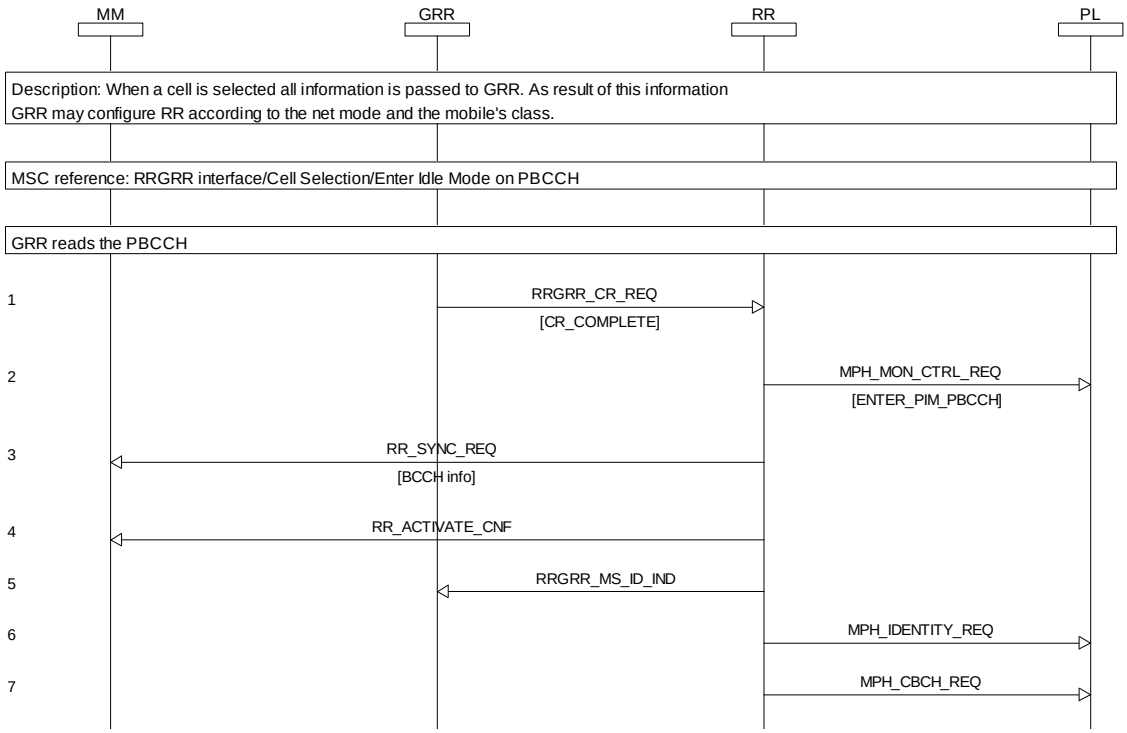


Figure 10 Cell is selected for idle mode PBCCH - Full service

2.1.11 Limited Service reached/ GPRS activated/ BCCH

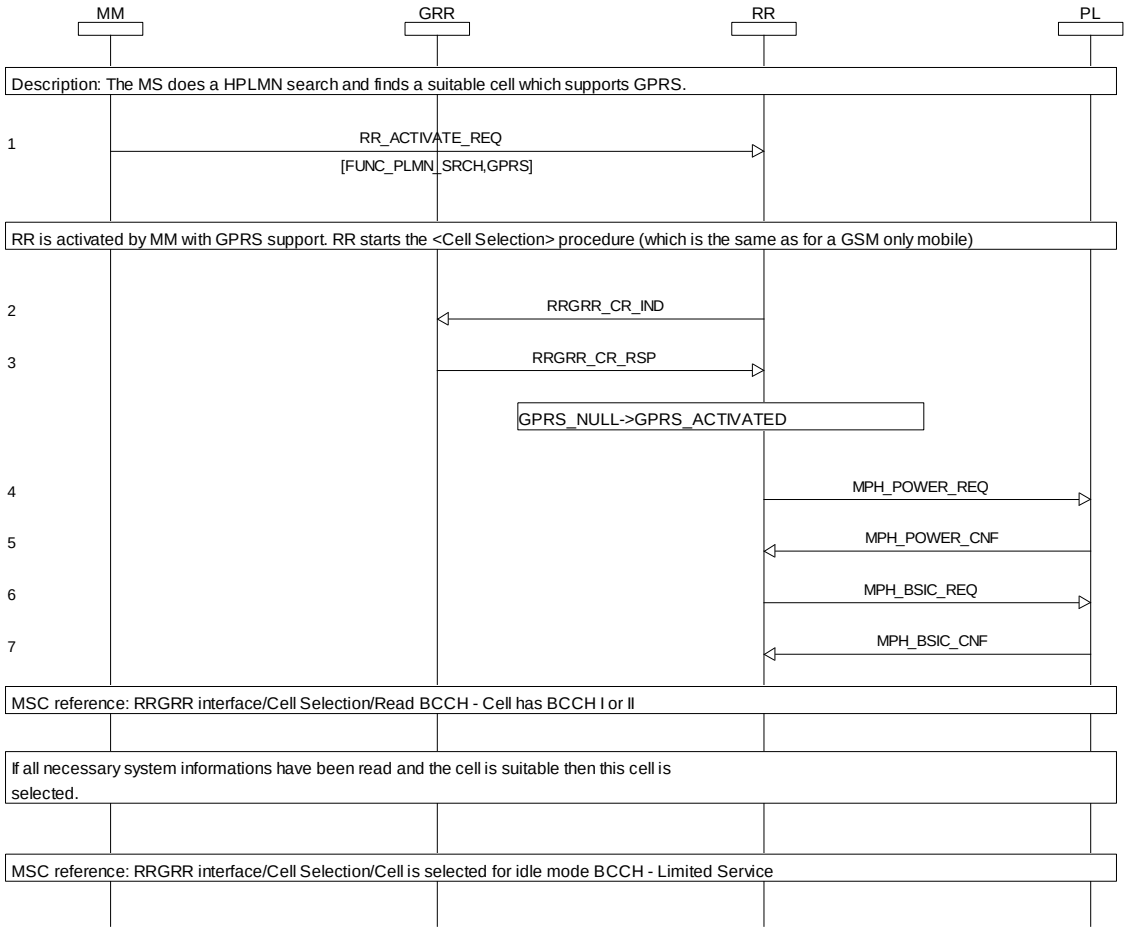


Figure 11 Limited Service reached/ GPRS activated/ BCCH

2.1.12 Cell is selected for idle mode BCCH - Limited Service

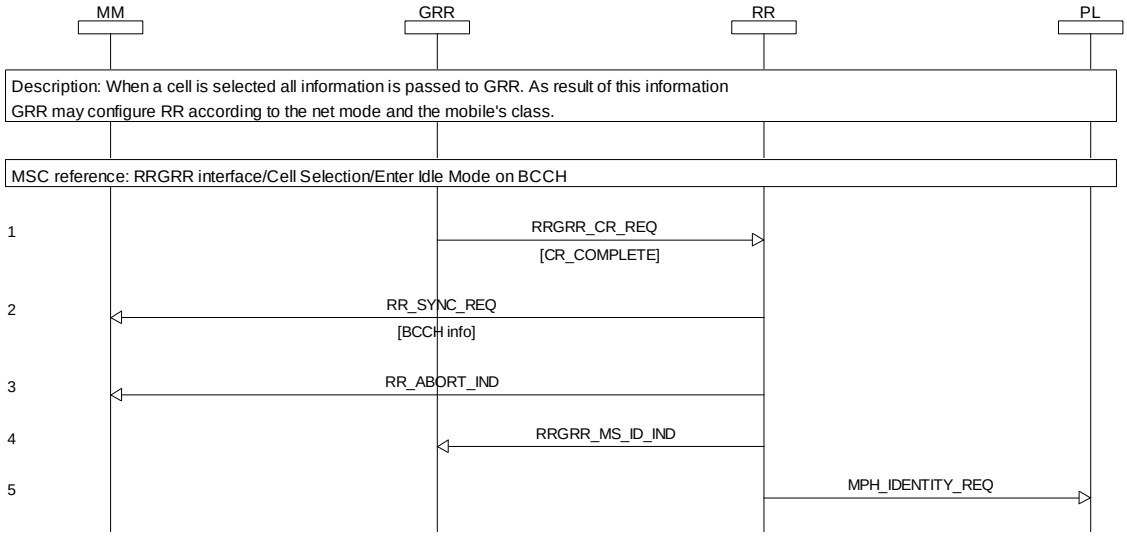


Figure 12 Cell is selected for idle mode BCCH - Limited Service

2.1.13 Limited Service reached/ GPRS activated PBCCH

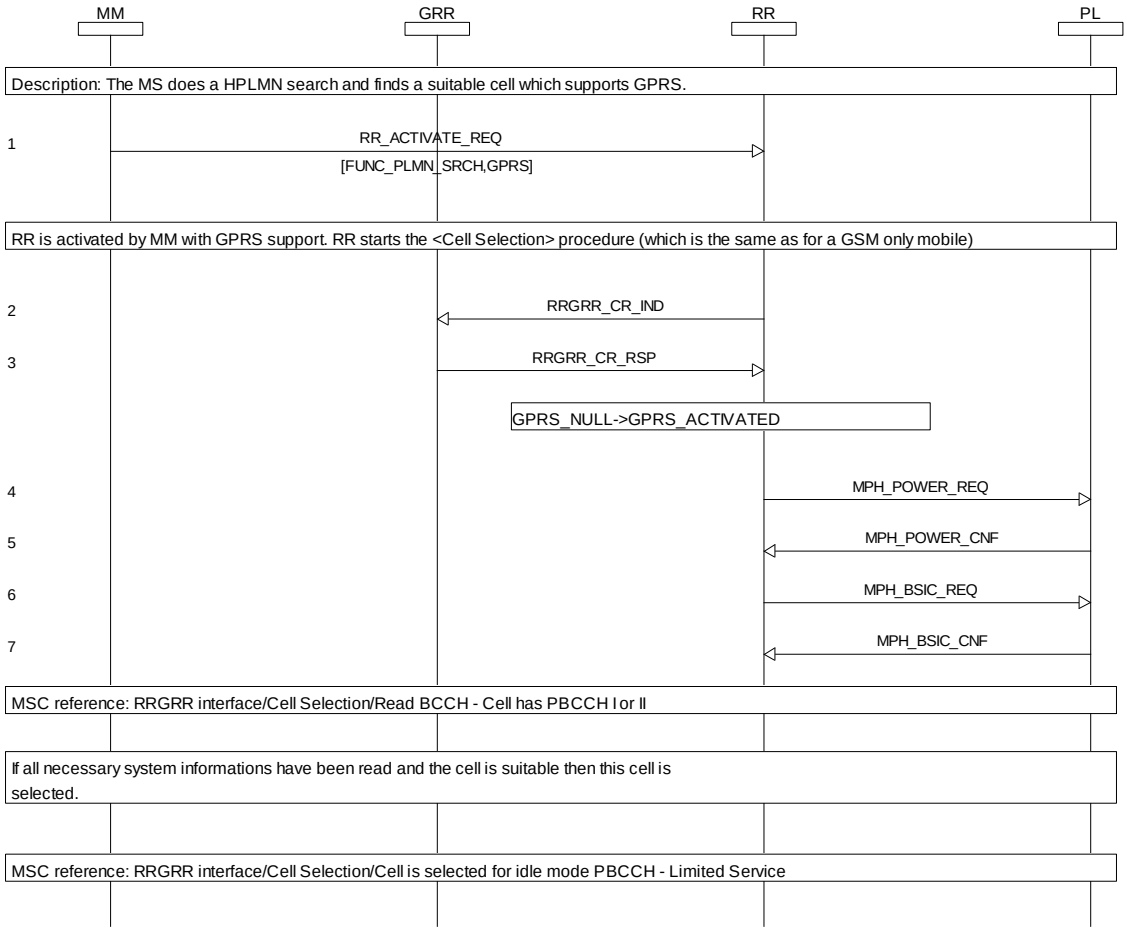


Figure 13 Limited Service reached/ GPRS activated PBCCH

2.1.14 Cell is selected for idle mode PBCCH - Limited Service

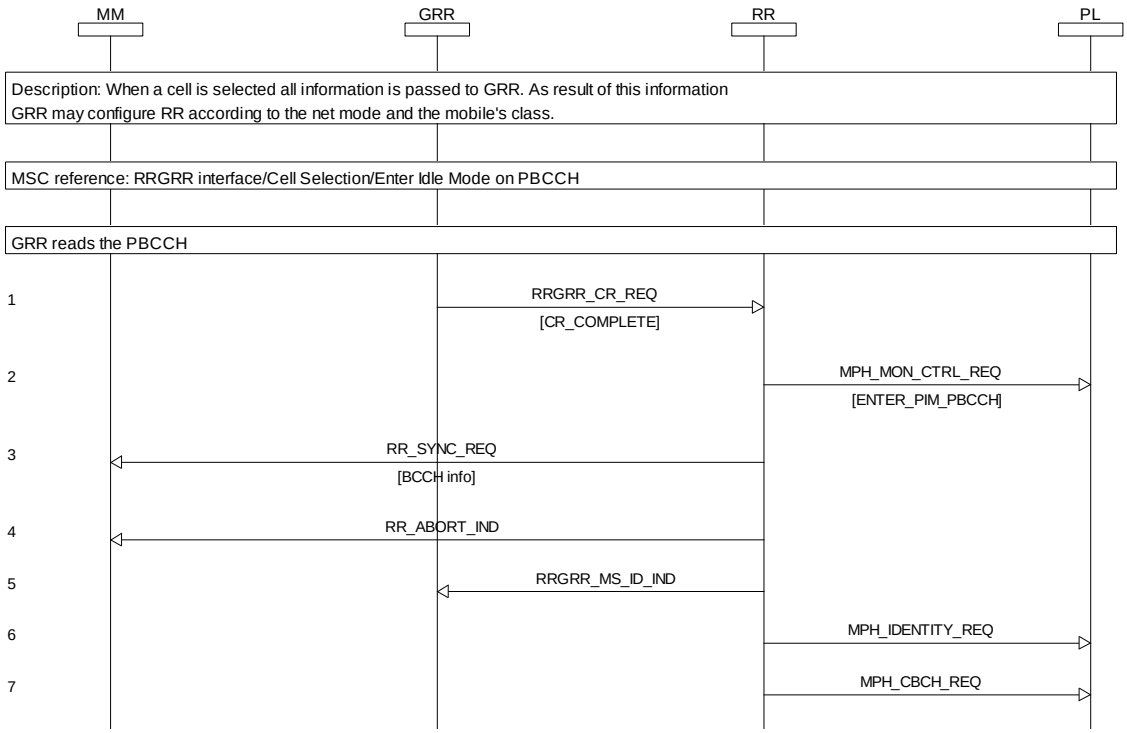


Figure 14 Cell is selected for idle mode PBCCH - Limited Service

2.1.15 GRR fails to read PBCCH

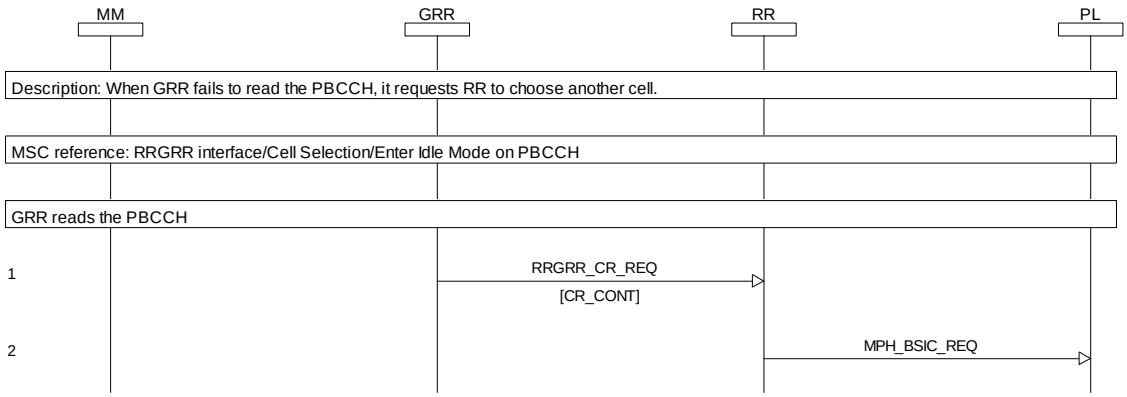


Figure 15 GRR fails to read PBCCH

2.2 Packet Access Procedure using CCCH

Description:

The Packet Access Procedure using CCCH is described in GSM 4.08 for support of GPRS services. The Packet access procedure is initiated by the GRR entity in order to establish a temporary block flow (TBF) which allows the transfer of LLC PDU's to the network.

The following things have to be done in the Access Procedure:

- check if access to the network is allowed.
- sending of CHANNEL REQUEST messages on the RACH. The CHANNEL REQUEST contains an establishment cause which indicates either one phase packet access or single block packet access and a random reference. The scheduling and number of CHANNEL REQUEST is the same as the circuit-switched Access Procedure.
- After having send M+1 CHANNEL REQUEST, the MS shall start T3146
- After having send the first CHANNEL REQUEST, the MS shall leave packet idle mode and start listening to the BCCH and the full CCCH. Following messages can be received in this state:
  - PACKET PAGING REQUEST: shall be ignored by MS
  - PAGING REQUEST: If a paging for a Class B MS for circuit-switched calls is reeived the MS checks if it should abort the packet access. As a consequence the PAGING can be ignored or the the packet access can be aborted.
  - IMMEDIATE ASSIGNMENT: If an IMMEDIATE ASSIGNMENT is received the MS checks the contents of the IMMEDIATE ASSIGNMENT for validity, if the message is not correct, the message is ignored. If the message is correct it is checked if it contains a Packet Downlink Assignment, the MS shall then abort the Packet Access Procedure and react to the Downlink Assignment. If the Immediate Asssignment is not a Packet Downlink Assignemnt then the MS checks if it contains the information field of one of the last 3 CHANNEL REQUEST messages send. Then it is checked if the IMMEDIATE ASSIGNEMNT is the first message in a two-message assaaignment:
    - no two-message assignment: If this is the case the timer T3146 is stopped. The contents of the IMMEDIATE ASSIGNMENT message is checked and if it defines a PDCH or SDCCH satisfactorily then the MS switches to the assigned PDCH/SDCCH and starts the contention resolution.
    - two-message assignemnt: The 1st IMMEDIATE ASSIGNMENT is stored and the MS waits for a 2nd message with the same information field as the 1st message for 2 multiframes after reception of the 1st ASSIGNMENT. When the MS receives a 2nd ASSIGNMENT which fulfills the above conditions the timer T3146 is stopped. The contents of the IMMEDIATE ASSIGNMENT message is checked and if they define a PDCH satisfactorily then the MS switches to the assigned PDCH and starts the contention resolution. If the 2nd IMMEDIATE ASSIGNMENT is not received within 2 multiframes then the 1st IMMEDIATE ASSIGNMENT is discarded. After this time any new IMMEDIATE ASSIGNMENT is treated as if the 1st IMMEDIATE ASSIGNMENT has not been received.
  - IMMEDIATE ASSIGNMENT EXTENDED: The MS checks if the message contains the information field of one of the last 3 CHANNEL REQUEST messages send. It then followes the same procedures as above. This can only be a non two-message assignment and only an assignment to a SDCCH.

- IMMEDIATE ASSIGNMENT REJECT: On receipt of an IMMEDIATE ASSIGNMENT REJECT message corresponding to one of its 3 last CHANNEL REQEUEST messages, the MS stops sending CHANNEL REQUEST messages, satrts timer T3142 with the indicated value, starts T3146 if it has not already been started, and listens to the downlink CCCH until T3146 expires. During this time, additional IMMEDIATE ASSIGNMENT REJECT messages are ignored, but any IMMEDIATE ASSIGNMENT corresponding to one of irs 3 last CHANNEL REQUEST messages, let the MS follow the above(normal) procedures. If the mobile station has received IMMEDIATE ASSIGNMENT REJECT messages from the network on all, or in case more than 3 were sent the last 3, of its CHANNEL REQUEST messages, it shall immediately return to PACKET IDLE state.
- T3142: The MS is not allowed to make a new attempt for packet access in the same cell until T3142 expires, but may attempt packet access in another cell after successful cell reselection for radio condition reasons. The value of the wait indication (i.e T3142) relates to the cell from which it was received. The MS may initiate RR connection establishment in the same cell before T3142 has expired.
- Failure Cases:
  - On expiry of timer T3142 a TBF establishment failure has occured and the MS returns tp PACKET IDLE state.
  - If the MS receives the IMMEDIATE ASSIGNMENT message for single block packet access after the TBF starting time has expired a TBF establishment failure has occured and the MS returns to PACKET IDLE state.
  - If the information available in the MS, after the reception of an IMMEDIATE ASSIGNMENT message or the second IMMEDIAE ASSIGNMENT message of a two-message assignmen, does not satisfactorily define a PDCH or if the mobile allocation indexes frequencies in more than one frequency band or the IMMEDIATE ASSIGNMENT message indicates a PDCH in non-supported frequency band then a TBF establishment failure has occured and the MS returns to PACKET IDLE state. (Implementation Note for the circuit-switched case: in these cases the IMMEDIATE ASSIGNEMNT message is ignored and the timer T3142 has not been stopped, so if no further IMMEDIATE ASSIGNMENT is received the procedure fails due to the timer expiry).

2.2.1 Mobile originated packet access / class B / net mode II / allocate PDCH / success

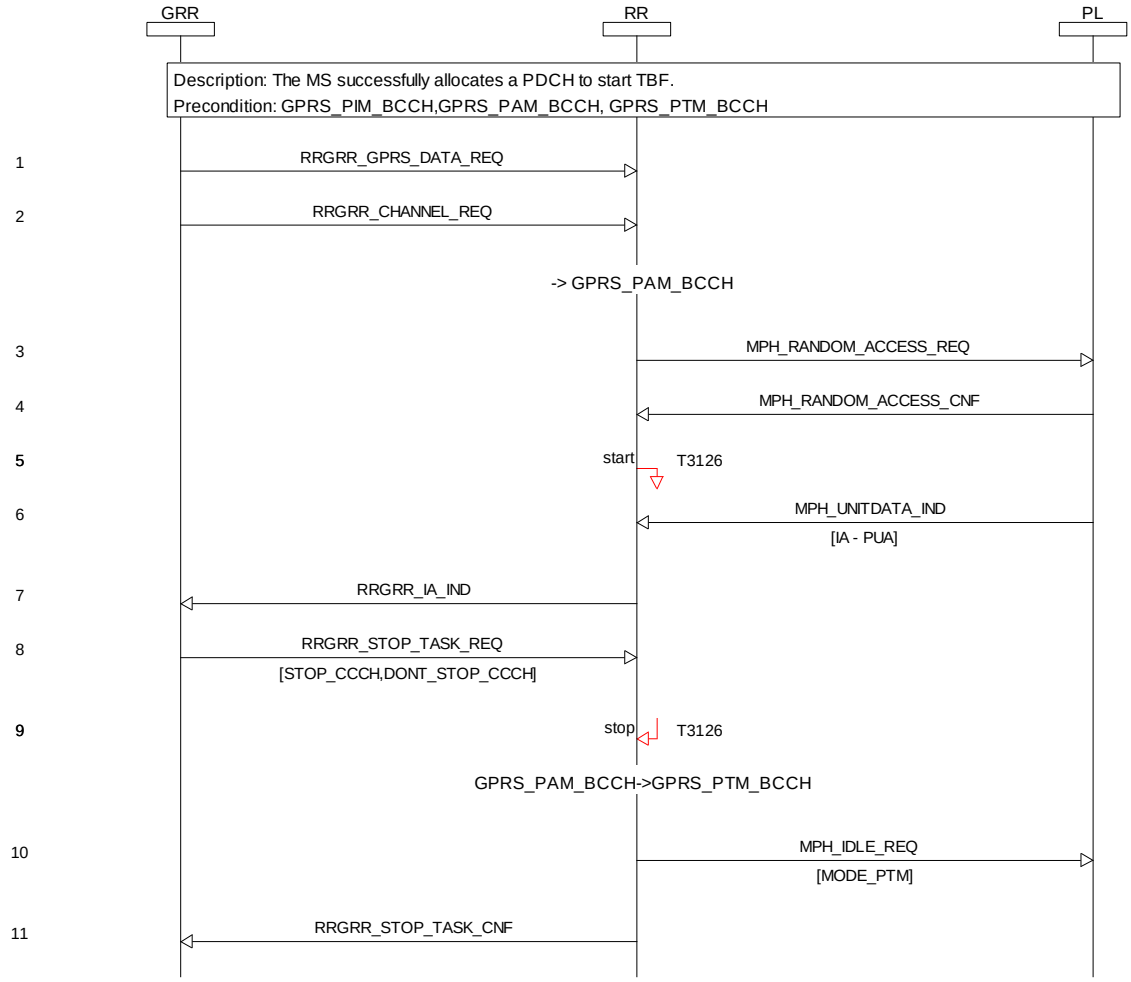


Figure 16: Mobile originated packet access / class B / net mode II / allocate PDCH / success

2.2.2 Mobile originated packet access / class B / net mode II / PDCH via TMA / success

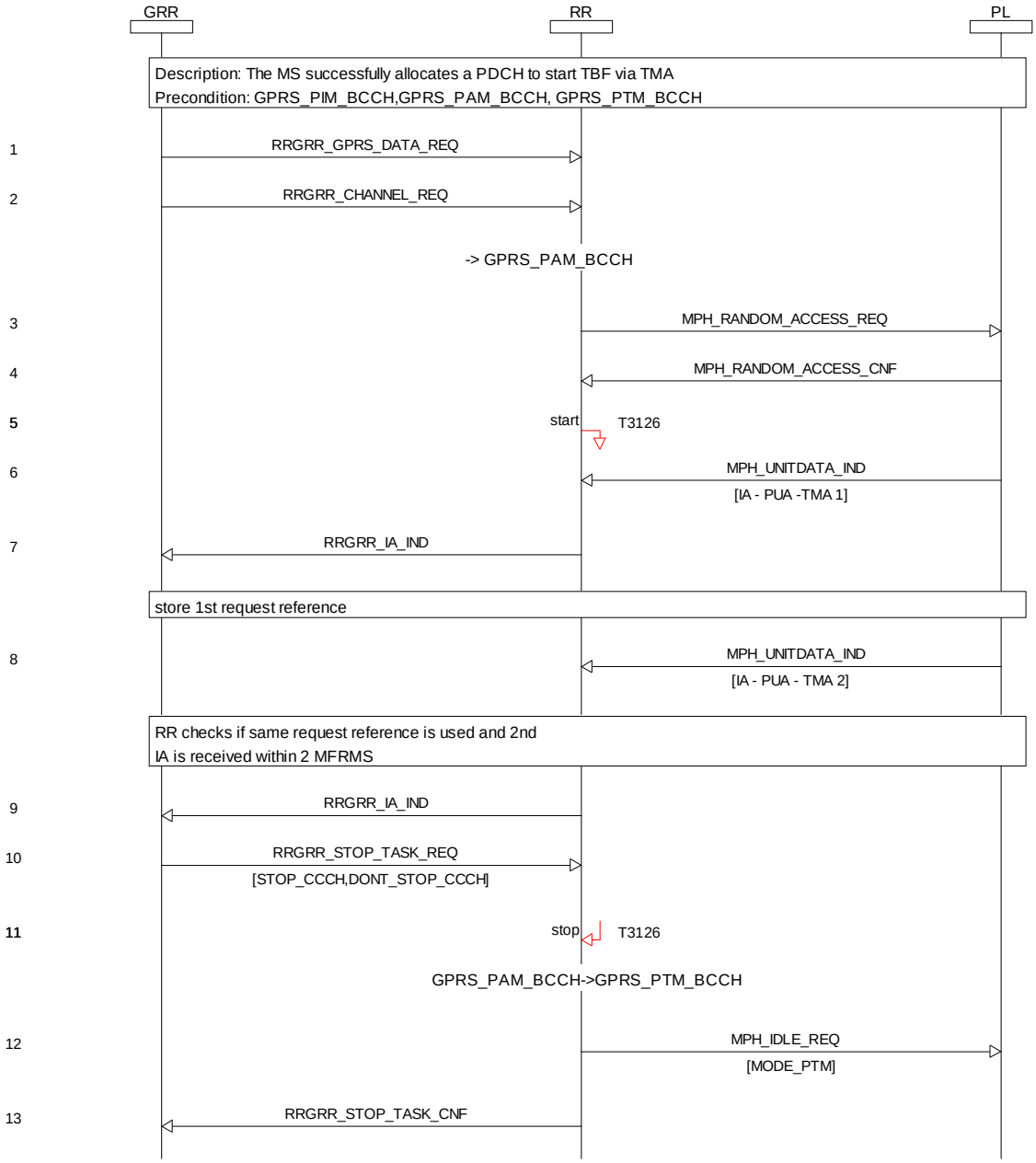


Figure 17 Uplink Packet Access/BCCH/TMA

2.2.3 Mobile originated packet access / class B / net mode II / allocate PDCH / failure I

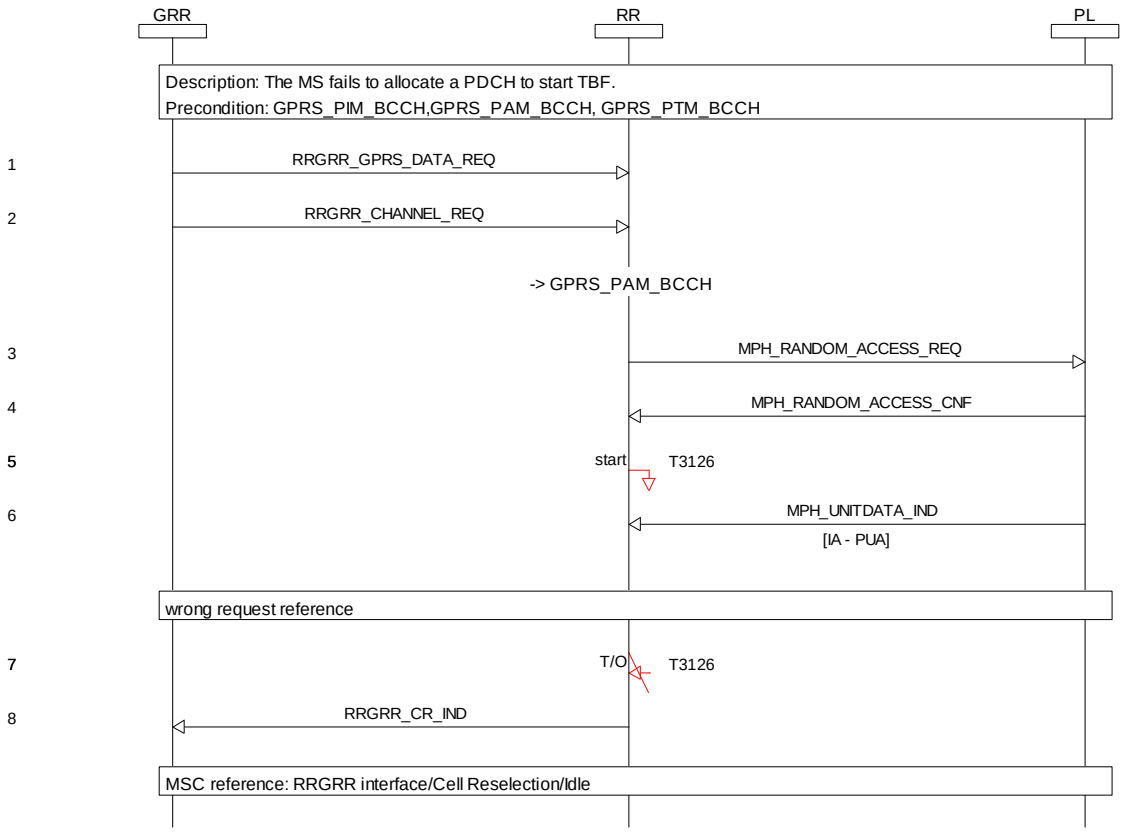


Figure 18 Uplink Packet Access/BCCH/failure I

2.2.4 Mobile originated packet access / class B / net mode II / allocate PDCH / failure II

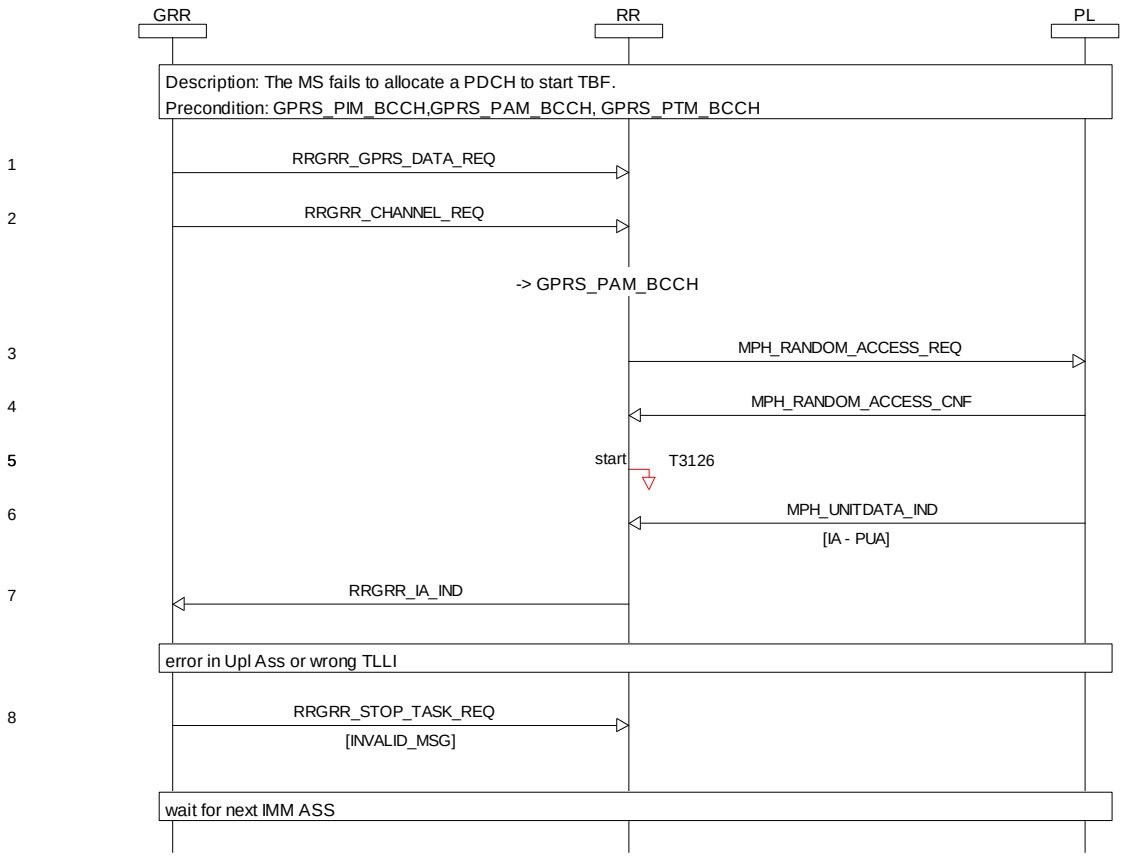


Figure 19 Uplink Packet Access/BCCH/failure II

2.2.5 Mobile originated packet access / class B / net mode II / assignment rejection

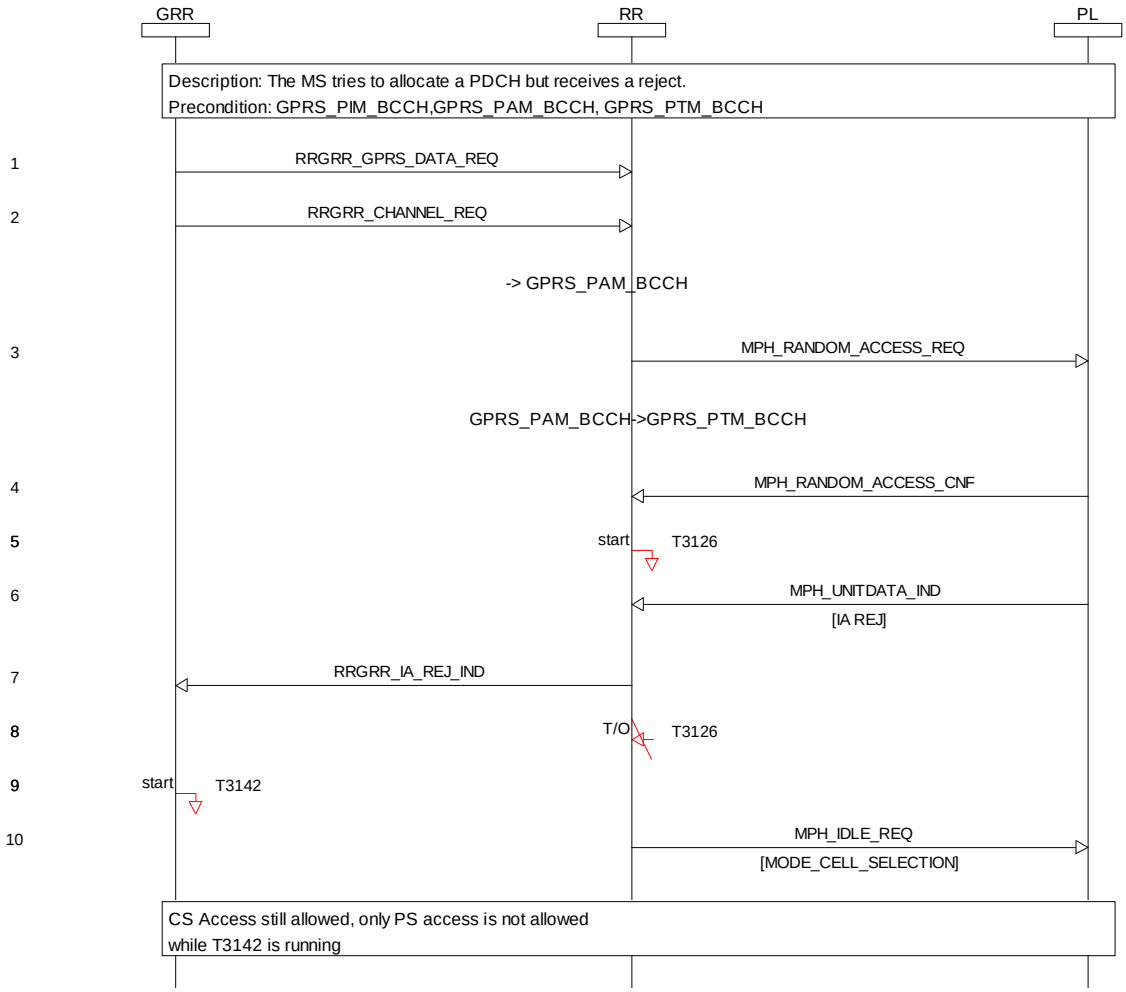


Figure 20 Uplink Packet Access/BCCH/IA Reject received

2.2.6 Mobile originated packet access / class B / net mode II / allocate PDCH / CS Paging received

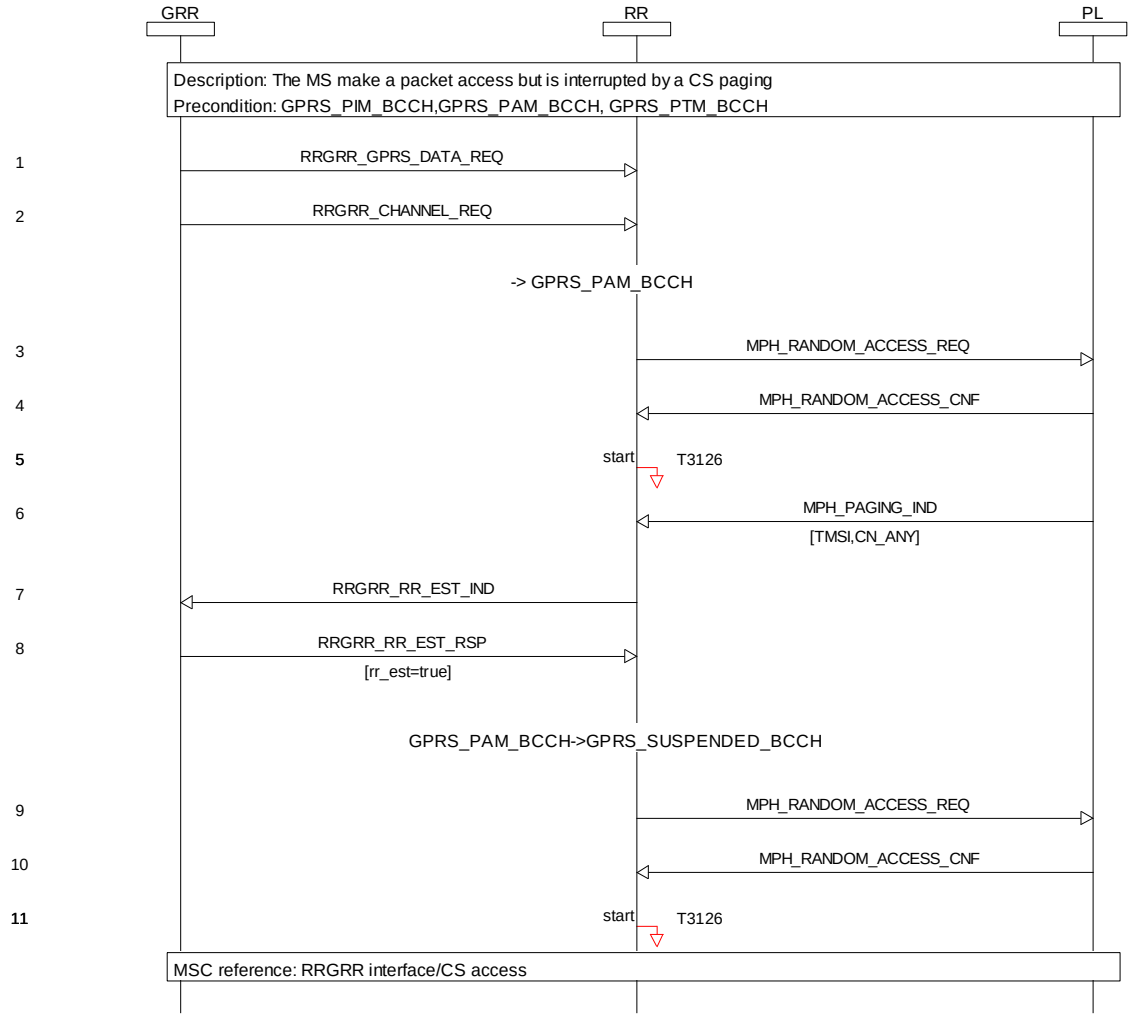
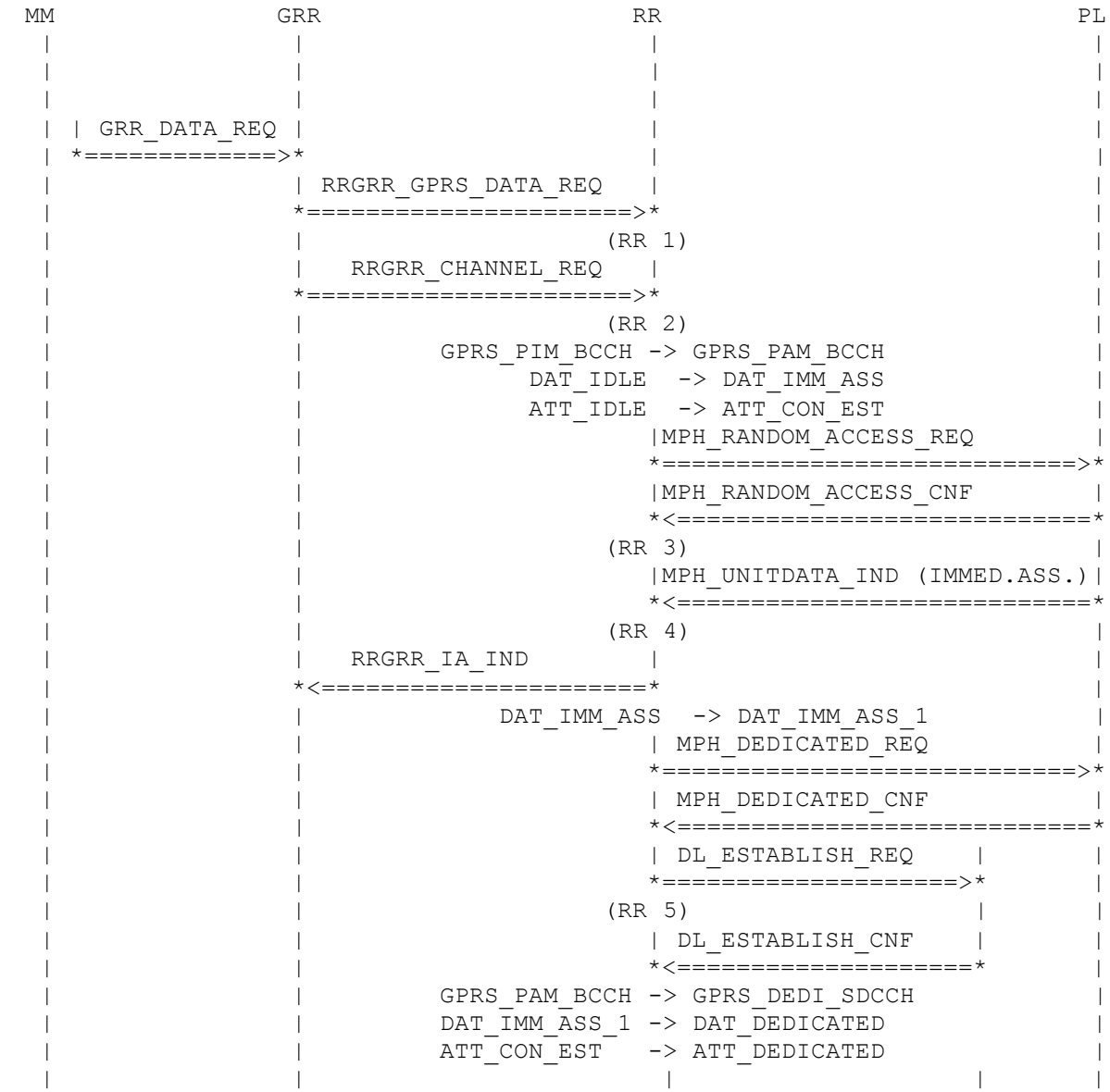


Figure 21 Packet Access interrupted by CS paging

2.2.7 Mobile originated packet access / class B / net mode II / allocate SDCCH / success

Description:

The MS successfully allocates a SDCCH.



(RR 1)
RR receives all necessary information from GRR to send a RR INITIALISATION REQUEST as SABM message if a SDCCH will be allocated for the MS.

(RR 2)
RR receives the channel request from GRR. RR starts the access procedure on the CCCH. RR does not need to check if there is a call active(GMM/GRR know this) or if the access is allowed(also checked by GRR). The wait indication(T3122) needs not to be checked for packet access and T3142 is checked by GRR.

(RR 3)
T3146 is started after sending all random bursts. T3146 uses T3126(the GSM equivalent) as they are the same.

(RR 4)
RR receives an Immediate Assignment message for a dedicated mode channel(SDCCH). RR checks if the IA is valid by comparing the random access reference. For a dedicated mode assignment RR sends a RRGRR_IA_IND if GRR has requested a channel else the normal RR procedures are used. T3146 is stopped on receipt of a valid IA.

(RR 5)
RR uses the information provided by the RRGRR_GPRS_DATA_REQ to send the RR INITIALISATIONN REQUEST as the SABM message.

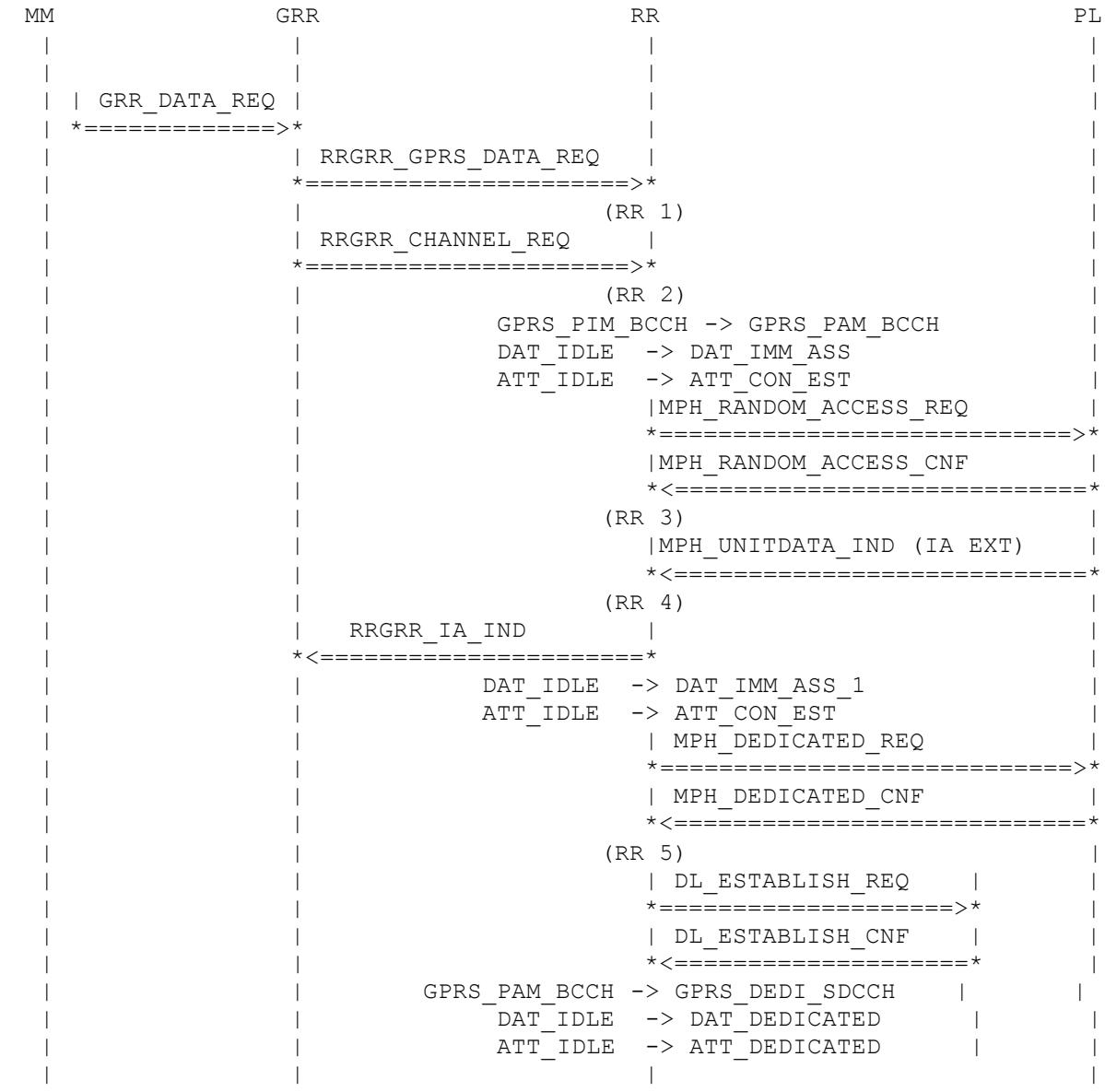
History:

12-Apr-00	MPA	Initial
18-Sep-00	MPA	revised

2.2.8 Mobile originated packet access / class B / net mode II / allocate SDCCH / success

Description:

The MS successfully allocates a SDCCH via a Immediate Assignment Extended Message.



(RR 1)
RR receives all necessary information from GRR to send a RR INITIALISATION REQUEST as SABM message if a SDCCH will be allocated for the MS.

(RR 2)
RR receives the channel request from GRR. RR starts the access procedure on the CCCH. RR does not need to check if there is a call active(GMM/GRR know this) or if the access is allowed(also checked by GRR). The wait indication(T3122) needs not to be checked for packet access and T3142 is checked by GRR.

(RR 3)
T3146 is started after sending all random bursts. T3146 uses T3126(the GSM equivalent) as they are the same.

(RR 4)
RR receives an Immediate Assignment Extended message which can only be for a SDCCH. RR checks if the IA is valid by comparing the random access reference. For a dedicated mode assignment RR sends a RRGRR_IA_IND if GRR has requested a channel else the normal RR procedures are used. T3146 is stopped on receipt of a valid IA.

(RR 5)
RR uses the information provided by the RRGRR_GPRS_DATA_REQ to send the RR INITIALISATIONN REQUEST as the SABM message.

(RR 6)
RR releases the DL connection. informs GRR of the channel release and enters idle mode. RR selects the cell with the highest C2 value and synchronizes on that cell.

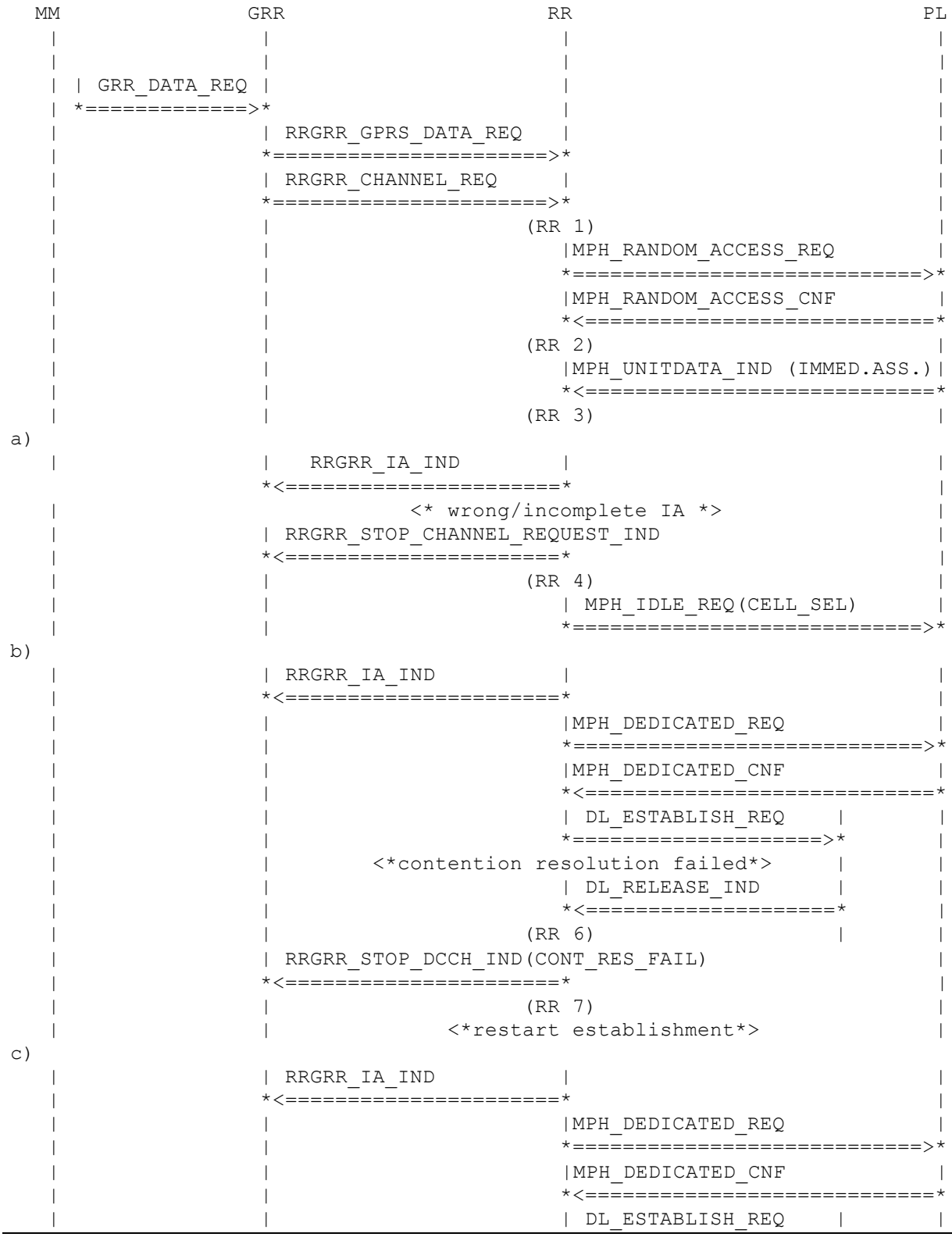
(RR 7)
RR selects the cell with the highest C2 index and makes a cell reselection n this cell.

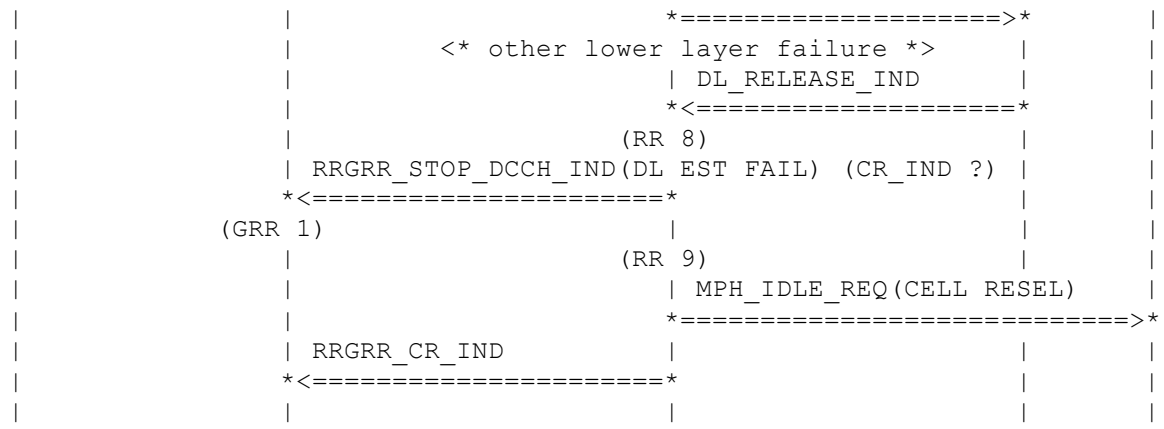
History: 18-Sep-00 MPA Initial

2.2.9 Mobile originated packet access / class B / net mode II / allocate SDCCH / failure

Description:

The MS fails to allocate a SDCCH.





(RR 1)
RR receives the channel request from GRR. RR starts the access procedure on the CCCH. RR does not need to check if there is a call active(GMM/GRR know this) or if the access is allowed(also checked by GRR). The wait indication(T3122) needs not to be checked for packet access and T3142 is checked by GRR.

(RR 2)
T3146 is started after sending all random bursts. T3146 uses T3126(the GSM equivalent) as they are the same.

(RR 3)
RR receives an Immediate Assignment message for a dedicated mode channel(SDCCH). RR checks if the IA is valid by comparing the random access reference. For a dedicated mode assignment RR sends a RRGRR_IA_IND if GRR has requested a channel else the normal RR procedures are used. T3146 is stopped on receipt of a valid IA.

(RR 4)
RR notices wrong/invalid/incomplete assignment information and aborts the procedure due to T3146 expiry.

(RR 5)
RR does a cell reselection after the IA failure and returns to idle mode on that cell.

(RR 6)
RR receives a DL_RELEASE_IND with cause INFO_FIELD_MISMATCH which indicates a failed contention resolution.

(RR 7)
RR informs GRR about the failure.

(RR 8)
RR receives a DL_RELEASE_IND with a cause other than INFO_FIELD_MISMATCH. This indicates a lower layer failure which results in a cell reselection.

(RR 9)
RR informs GRR about the failure.

History:

12-Apr-00	MPA	Initial
18-Sep-00	MPA	revised

2.3 Packet Downlink Procedure using CCCH

Description:

The Packet Downlink Procedure using CCCH is described in GSM 4.08 R97 for support of GPRS services. The Downlink Assignment procedure is initiated by the netwrok in order to establish a temporary block flow (TBF) which allows the transfer of LLC PDSs to the MS.

Preconditions:

- The MS has to be in PACKET IDLE state to receive a Downlink Assignment.
- If the MS applies DRX, the IMMEDIATE ASSIGNMENT message, or the first part of the IMMEDIATE ASSIGNMENT message (in the case of a two-message assignment), shall be sent in a block corresponding to the paging group of the MS.

The following things have to be done in the Downlonk Assignment Procedure:

- If the MS receives an IMMEDIATE ASSIGNEMNT message, it checks if it is a Downlink Asssignment. If this is not the case, the IMMEDIATE ASSIGNMENT is ognored. If it is a Downlink Assignment it is checkd if it is the first message in a two-message assignment:
  - no two-message assignment: The contents of the IMMEDIATE ASSIGNMENT message is checked and if it defines a PDCH satisfactorily the MS stops listening to the CCCH and switches to the assigned PDCH.
  - two-message assignment: The MS stores the 1st IMMEDIATE ASSIGNMENT and then starts to listen to the full CCCH for two multiframe periods, in order to receive the 2nd IMMEDIATE ASSIGNMENT. If a IMMEDIATE ASSIGNMENT is received in this period, it is checked if it contains the same information field as the 1st ASSIGNMENT. If this is the case the contents of the IMMEDIATE ASSIGNMENT messages are checked and if they define a PDCH satisfactorily then the MS stops listening to the CCCH and switches to the assigned PDCH. If the 2nd ASSIGNMENT is not received within two multiframe periods, the MS discards the 1st ASSIGNMENT and resumes DRX mode.
- Failure Cases:
- If the MS does not receive a RLC/MAC block on the assigned PDCH before the timer T3190 expires, then a TBF establishment failure has occured and the MS returns to PACKET IDLE state.
- If the information available by the MS, after the reception of an(the) IMMEDIATE ASSIGNMENT(s) does not satisfactorily define a PDCH or the mobile allocation in the frequency parameters indexes frequencies in more than one frequency band, then the MS shall ignore the assignment.
- If the mobile station receives the IMMEDIATE ASSIGNMENT message after the TBF starting time has expired for a single block packet donwlikn assignment, it shall ignore the assignment.

2.3.1 Mobile terminated packet access / Downlink Assignment / class B / net mode II

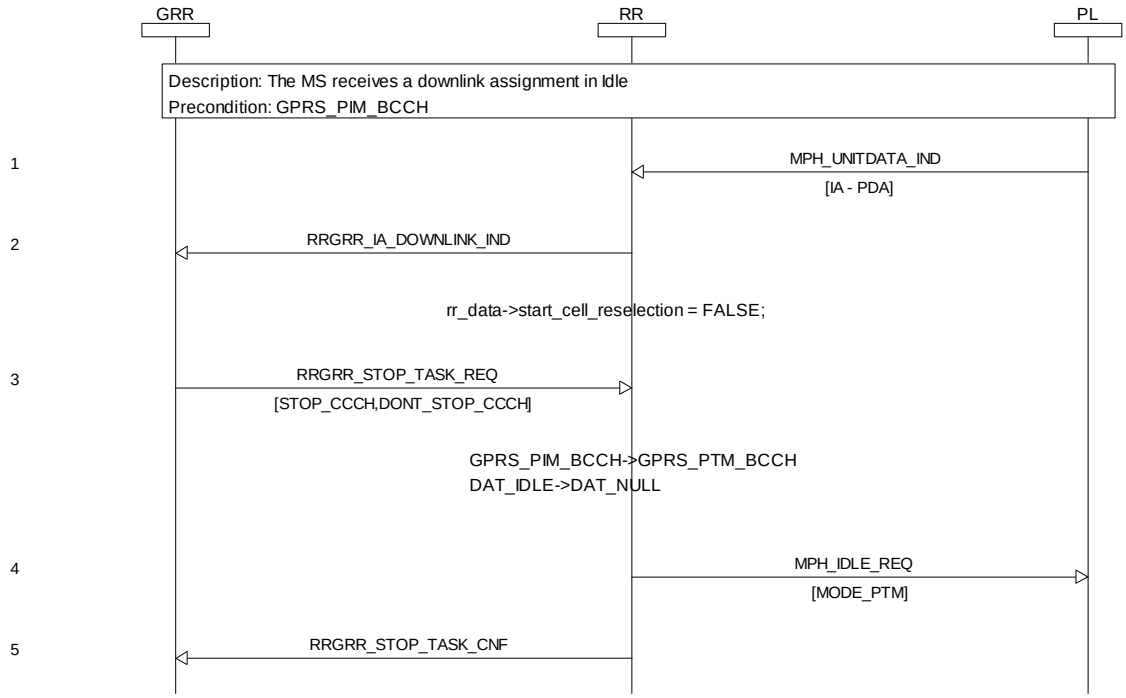


Figure 22 Downlink Assignment in IDLE/success

2.3.2 Mobile terminated packet access / Downlink Assignment TMA / class B / net mode II

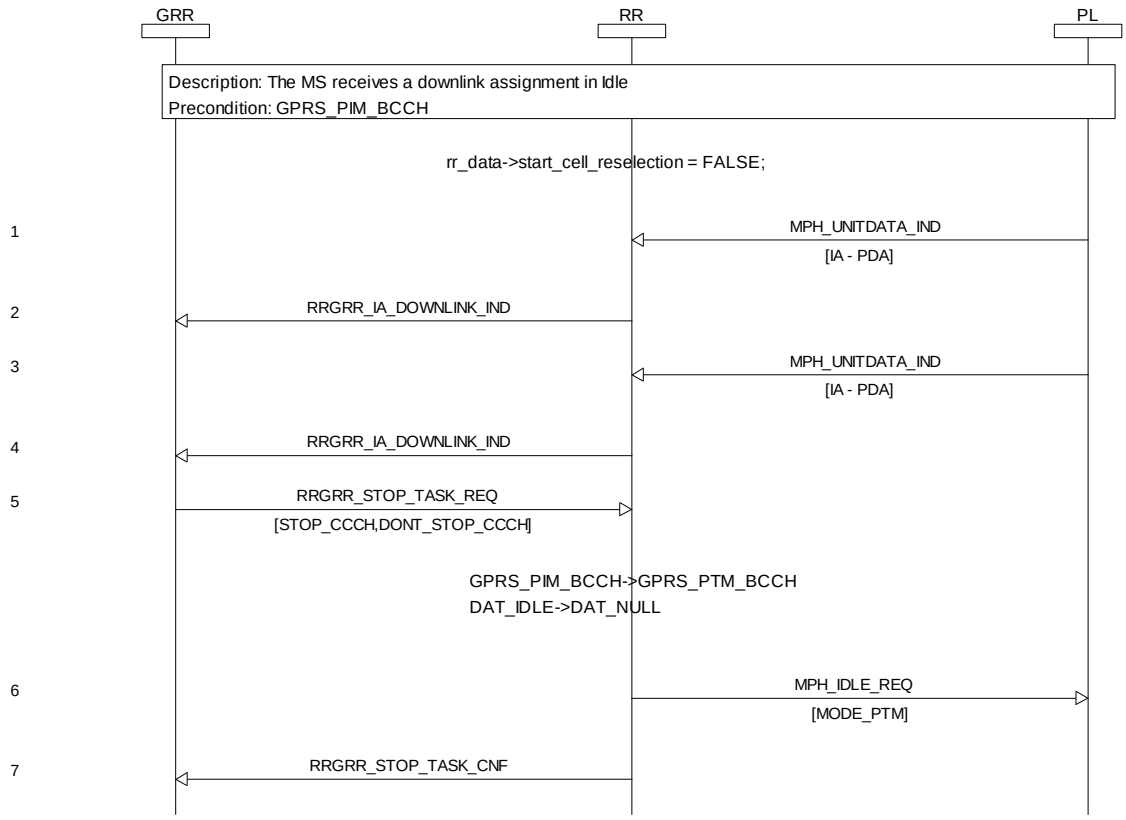


Figure 23 TMA Downlink Assignment/success

2.3.3 Mobile terminated packet access / Downlink Assignment Failure / class B / net mode II

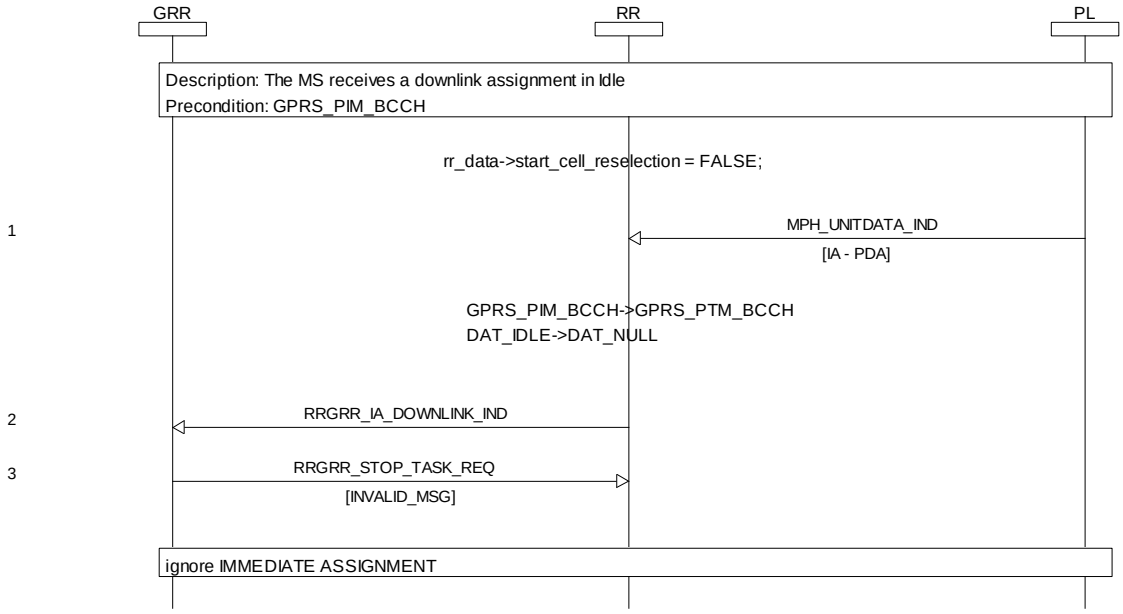


Figure 24 Downlink Assignment/ failure

2.4 Packet Paging Procedure using CCCH

2.4.1 Mobile terminated packet access / packet paging / net mode II

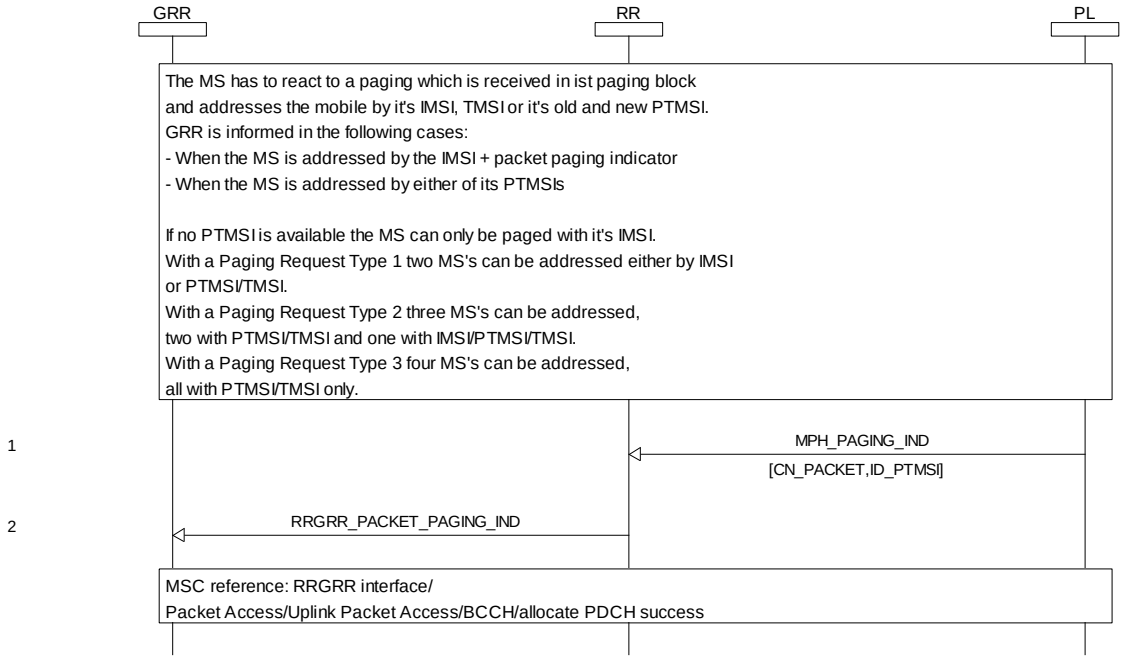


Figure 25 Packet Paging

2.5 Mobile originated circuit-switched call

2.5.1 Mobile originated call / class B / any nmo/BCCH/same cell

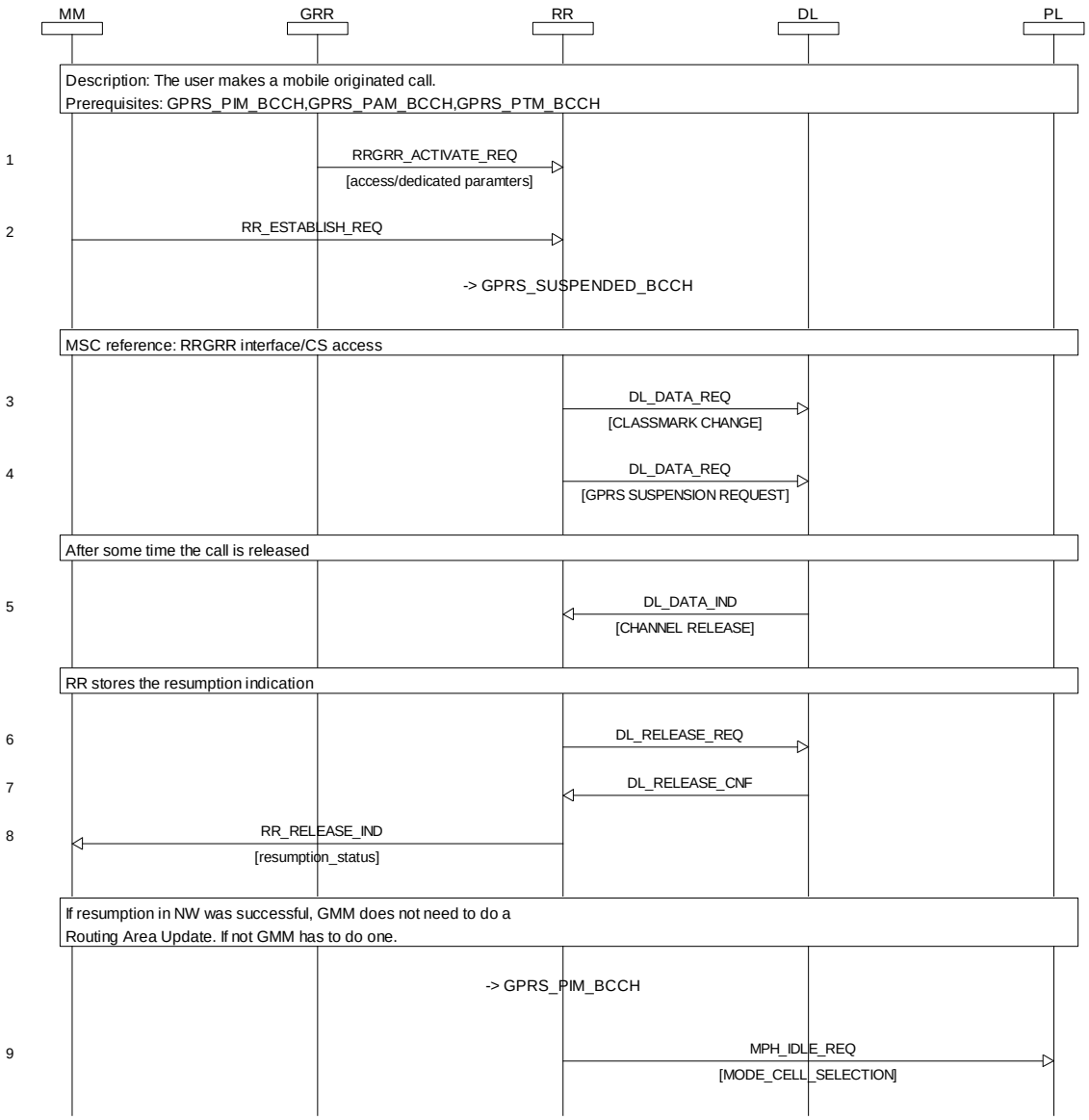


Figure 26 Mobile originated call/ class B/ any nmo/BCCH/same cell

2.5.2 Mobile originated call / class B / any nmo/BCCH/different cell

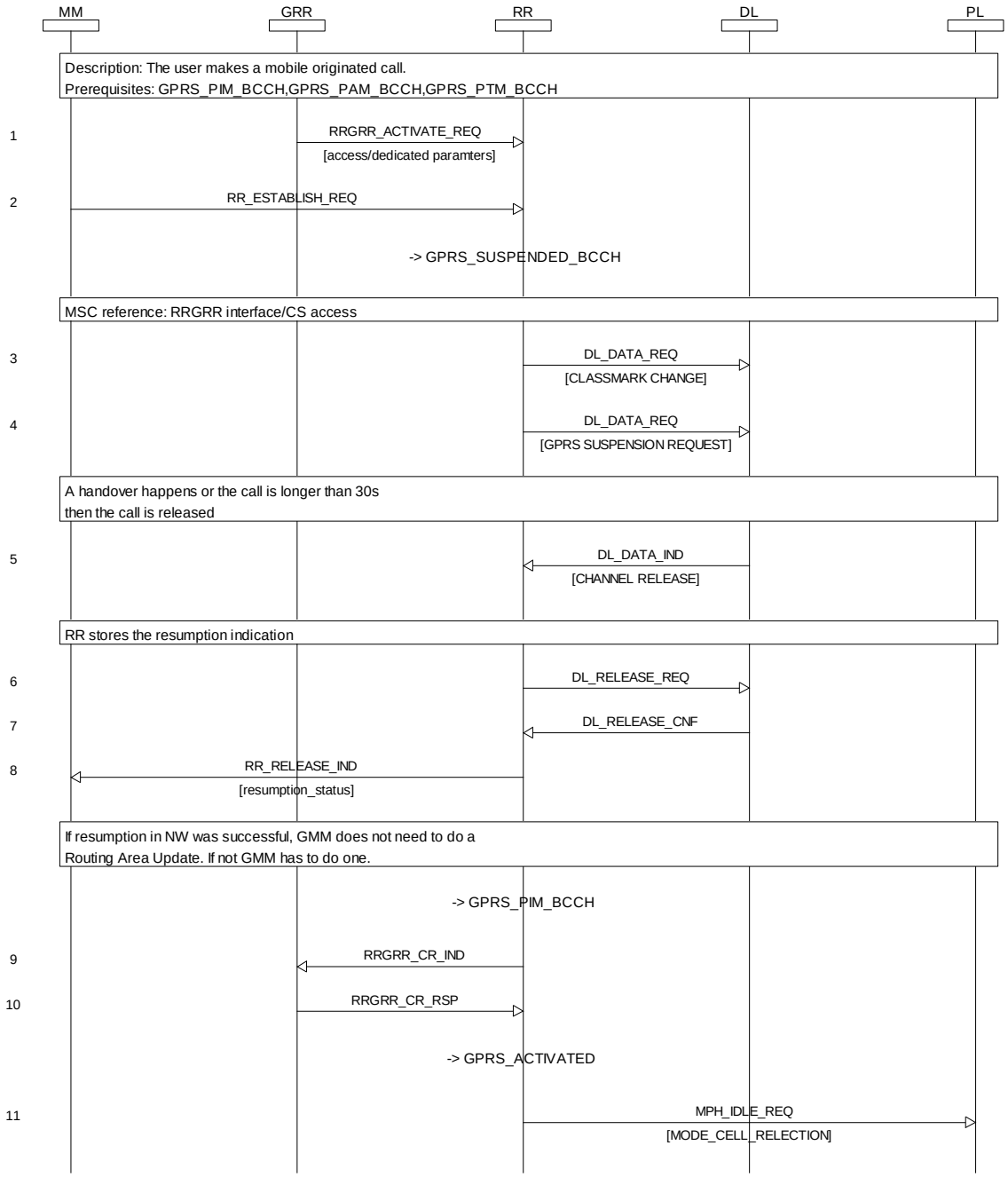


Figure 27 Mobile originated call / class B / any nmo/BCCH/different cell

2.5.3 Mobile originated call/class B/any NMO/PBCCH/same cell

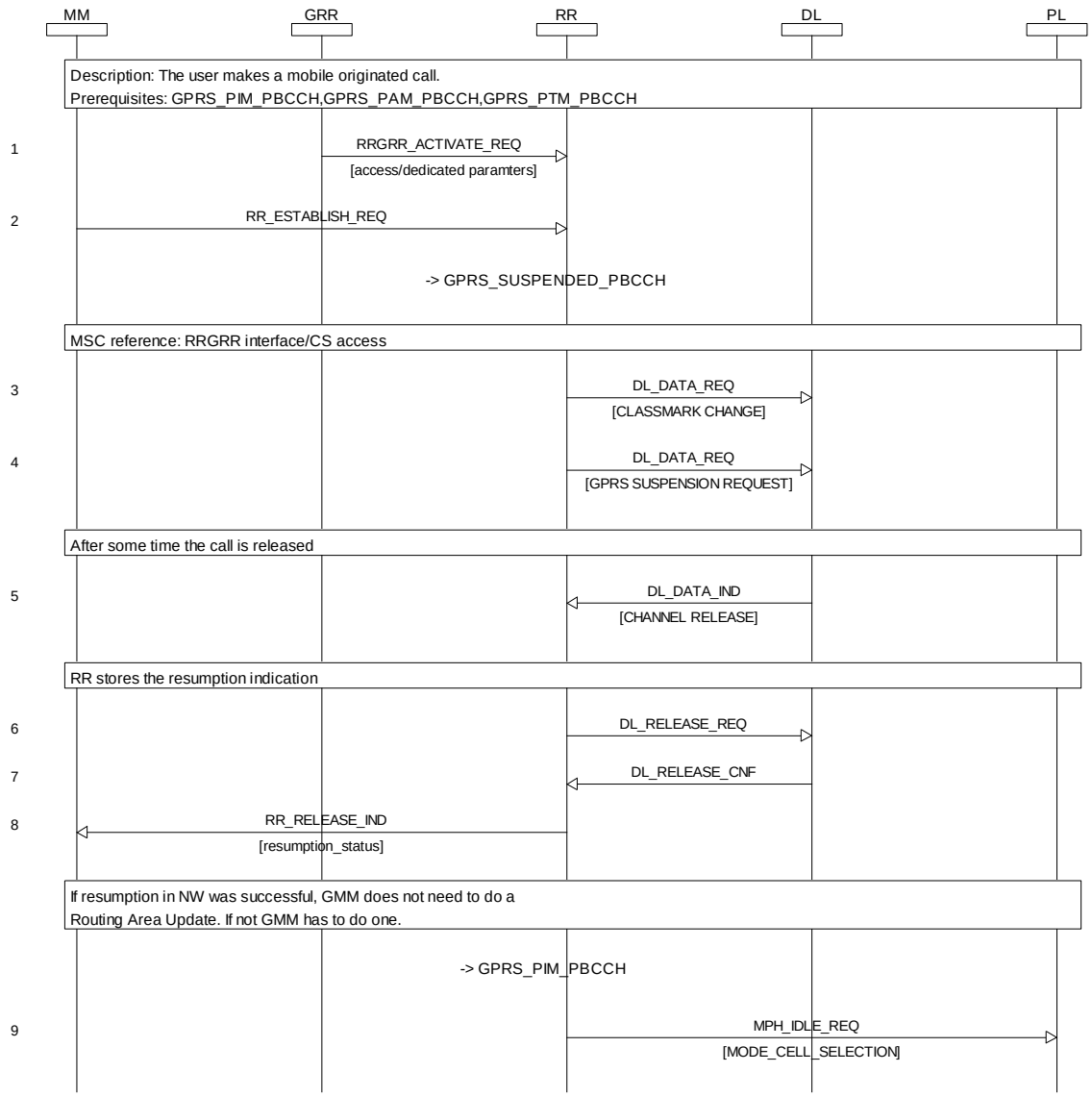


Figure 28 Mobile Originated Call/Class B/any NMO/PBCCH/same cell

2.5.4 Mobile originated call/class B/any NMO/PBCCH/different cell

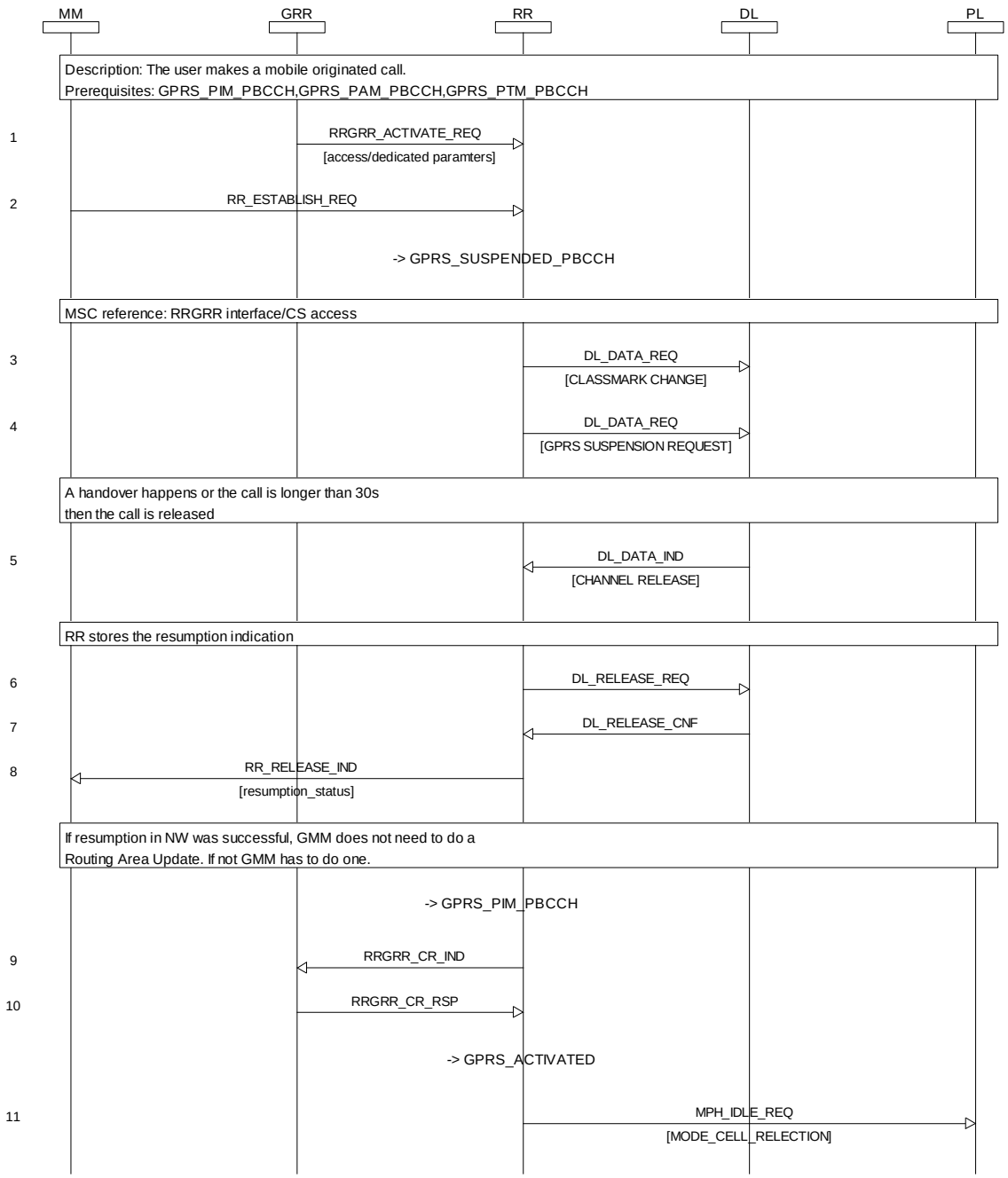


Figure 29 Mobile Originated Call/Class B/any NMO/PBCCH/different cell

2.5.5 Mobile originated call/ PBCCH/ access fails

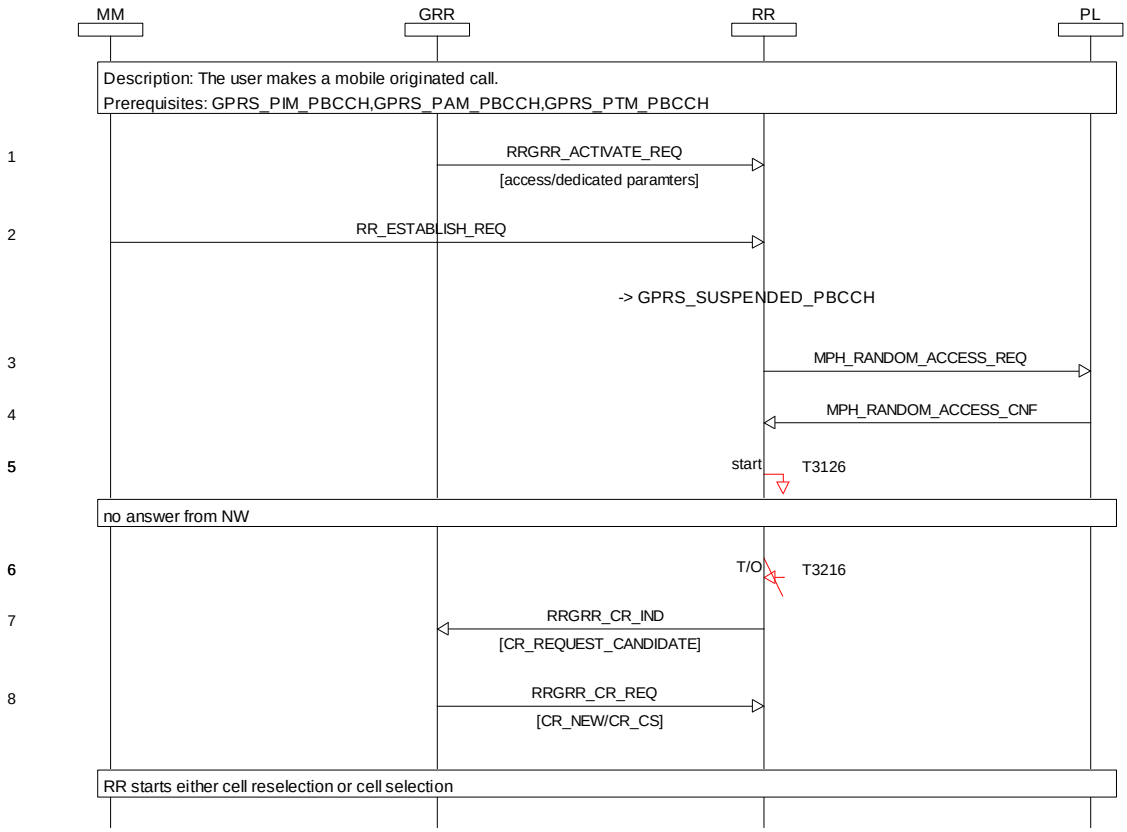


Figure 30 Mobile originated call/ PBCCH/ access fails

2.5.6 Mobile originated call/ PBCCH/ event "temporary resource shortage"/ Connection for LUP

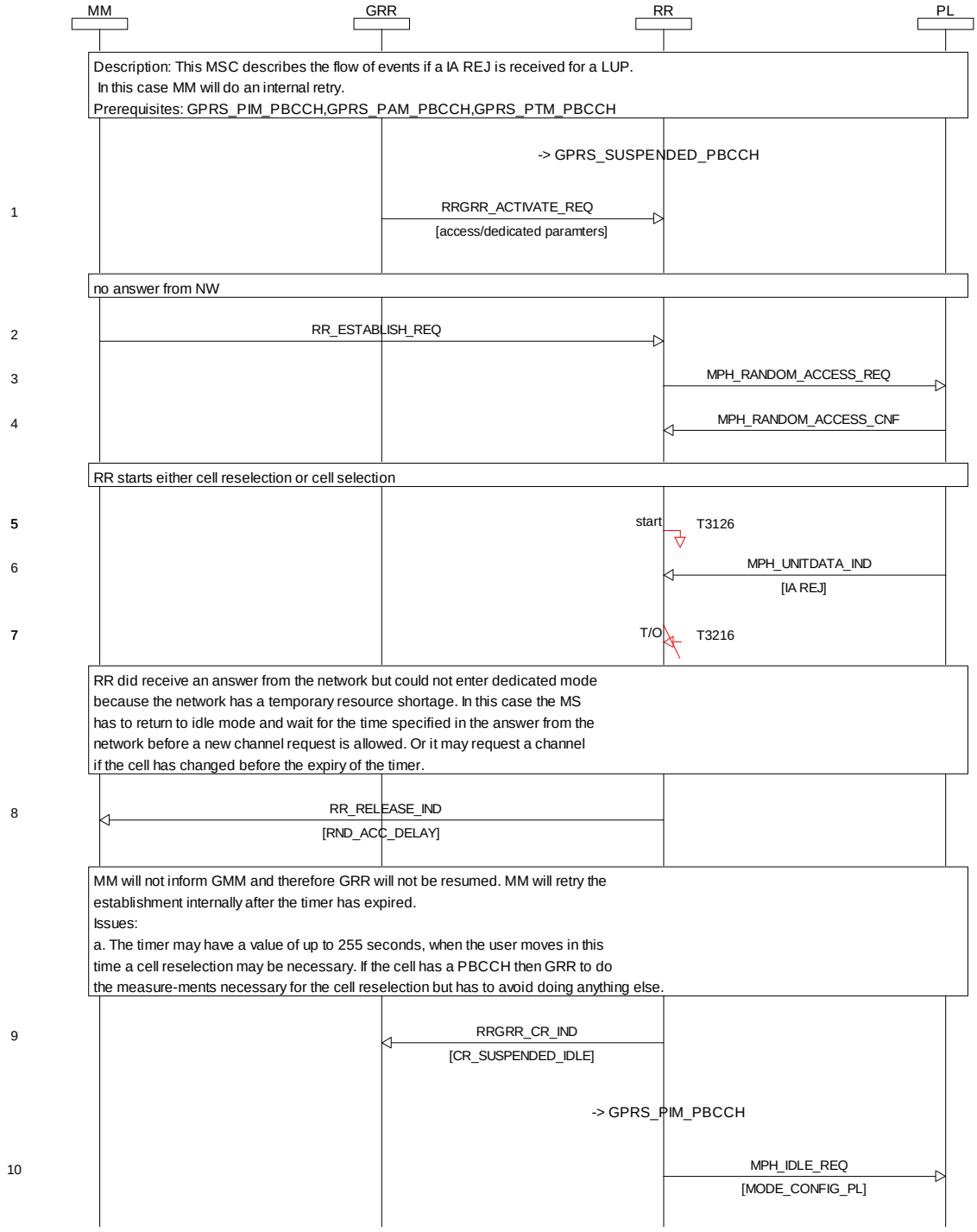
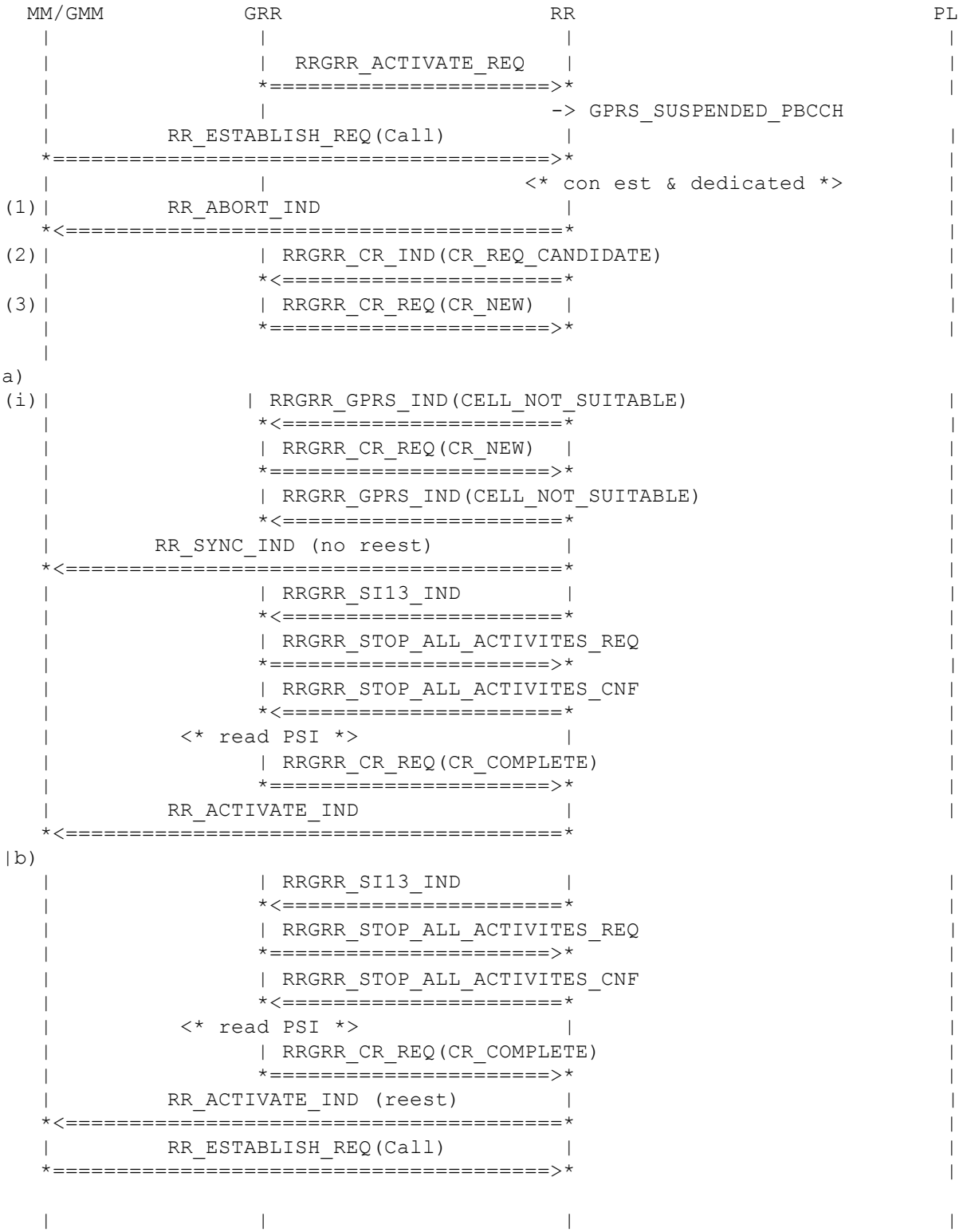


Figure 31 Mobile originated call/ PBCCH/ event "temporary resource shortage"/ Connection for LUP

2.5.7 Mobile originated call/ PBCCH/ Radio Link Failure

Description:

For a class B mobile the GPRS part has to be suspended to make a CS call. When a call is established and a radio link failure occurs a re-establishment may be tried. This is handled using a special procedure. XXX



1) RR informs MM of a radio link failure in dedicated mode. MM does not resume GMM/GRR and waits for an indication if call re-establishment is possible or not.
2) RR request the best ncell from GRR for re-establishment.
3) GRR start the cell reselection for the best the cell
   Issues:
   a. GRR has to
4) Depending on the cell configuration two scenarios can happen:
   Issues:
   a. Re-establishment is not possible then RR will inform MM of the re-establishment failure and a normal reselection will take place and MM will resume GMM/GRR.
      i. The cell is not suitable because it does not support re-est. The next cell is chosen by GRR.
   b. Re-establishment is possible then GRR may has to read the PBCCH but has to stay in suspended mode, because MM will retry the connection establishment afer receiving the RR_ESTABLISH_IND

2.5.8 Mobile originated call / class BG / net mode III

Description:

Is rejected in MM because the MS only does GPRS services if class BG and in net mode III.

2.5.9 Mobile originated call / class C / net mode I,II,III

Description:

Is not possible.

2.5.10 Mobile originated call / class A / net mode I,II,III

Description:

Any net mode. Uses normal GSM procedures.

2.6 Mobile terminated circuit-switched call

Paging Coordination Table:
NMO – the current network mode of the cell
PagCoord in PTM – in a R99 NW this can set in order to optimize the paging coordination for NM II and III in packet transfer mode
PBCCH – is a PBCCH available
State – current state of MS
CS paging – where to listen for CS pagings
PS paging – where to listen for PS pagings

NMO	PagCoord in PTM	PBCCH	State	CS Paging	PS Paging
I	x	PBCCH	PIM	PCCCH	PCCCH
I	x	BCCH	PIM	CCCH	CCCH
II	x	PBCCH	PIM	CCCH	CCCH
II	x	BCCH	PIM	CCCH	CCCH
III	x	PBCCH	PIM	CCCH	PCCCH
III	x	BCCH	PIM	CCCH	CCCH
I	y	PBCCH	PTM	PACCH	-
I	y	BCCH	PTM	PACCH	-
II	y	PBCCH	PTM	PACCH	-
II	y	BCCH	PTM	PACCH	-
II	n	PBCCH	PTM	CCCH	-
II	n	BCCH	PTM	CCCH	-
III	y	PBCCH	PTM	PACCH	-
III	y	BCCH	PTM	PACCH	-
III	n	PBCCH	PTM	CCCH	-
III	n	BCCH	PTM	CCCH	-

2.6.1 Mobile terminated circuit switched call / class B / on CCCH

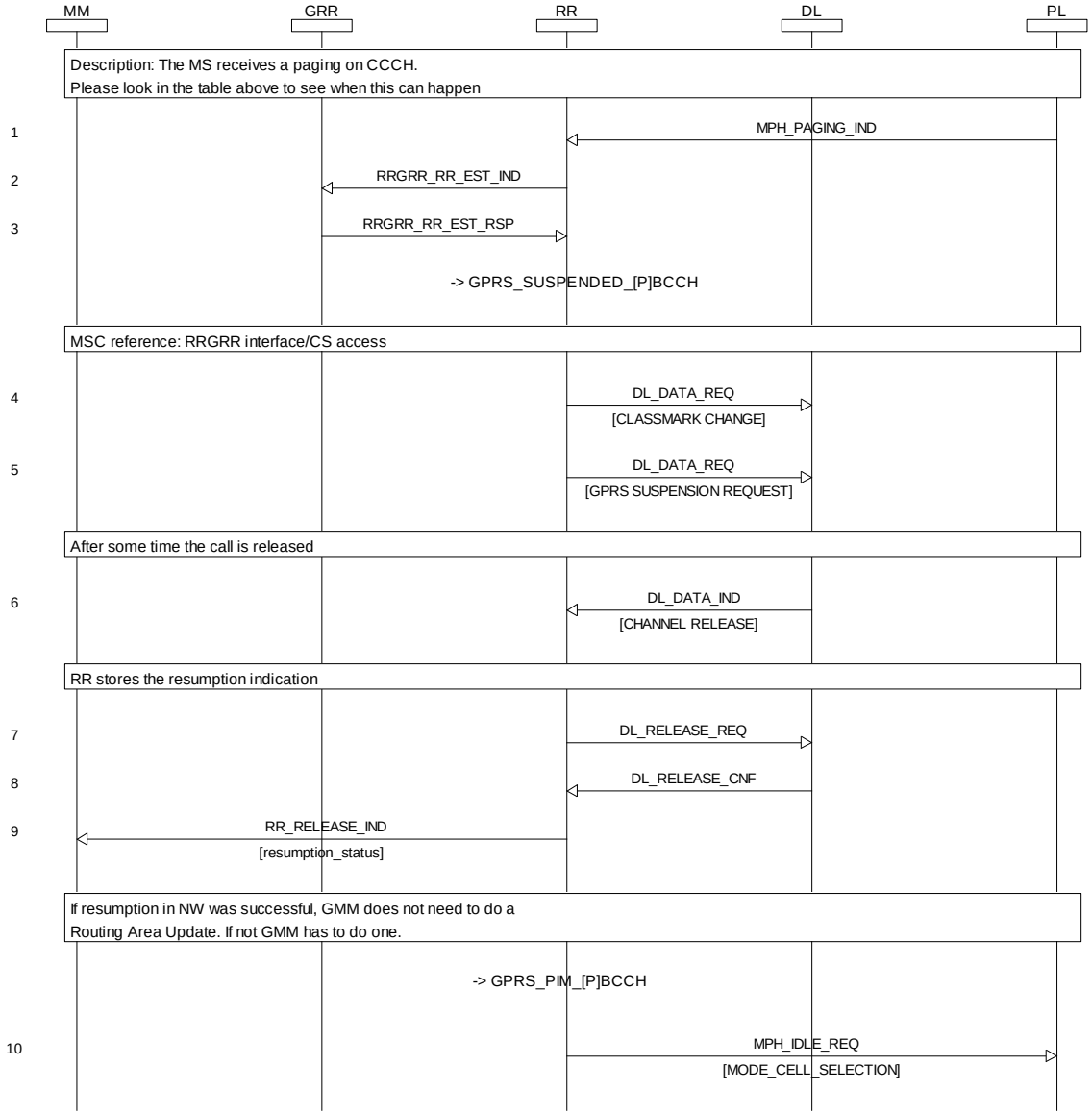


Figure 32 Mobile terminated circuit switched call / class B / on CCCH

2.6.2 Mobile terminated circuit switched call / class B / on PCCCH or PACCH

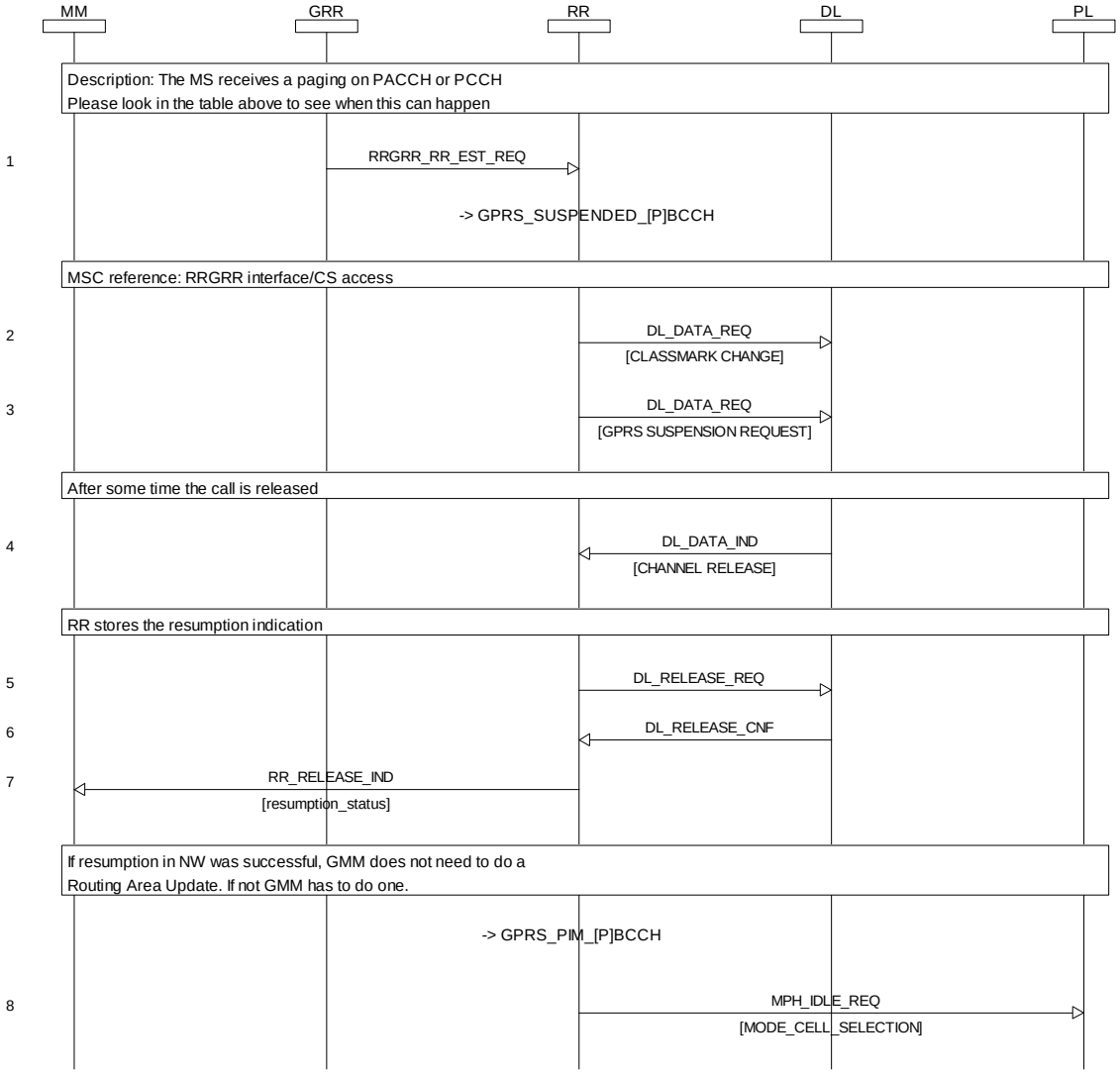


Figure 33 Mobile terminated circuit switched call / class B / on PCCCH or PACCH

2.7 RR procedures in packet idle and transfer mode

2.7.1 Serving cell system information reading / class B/ net mode II

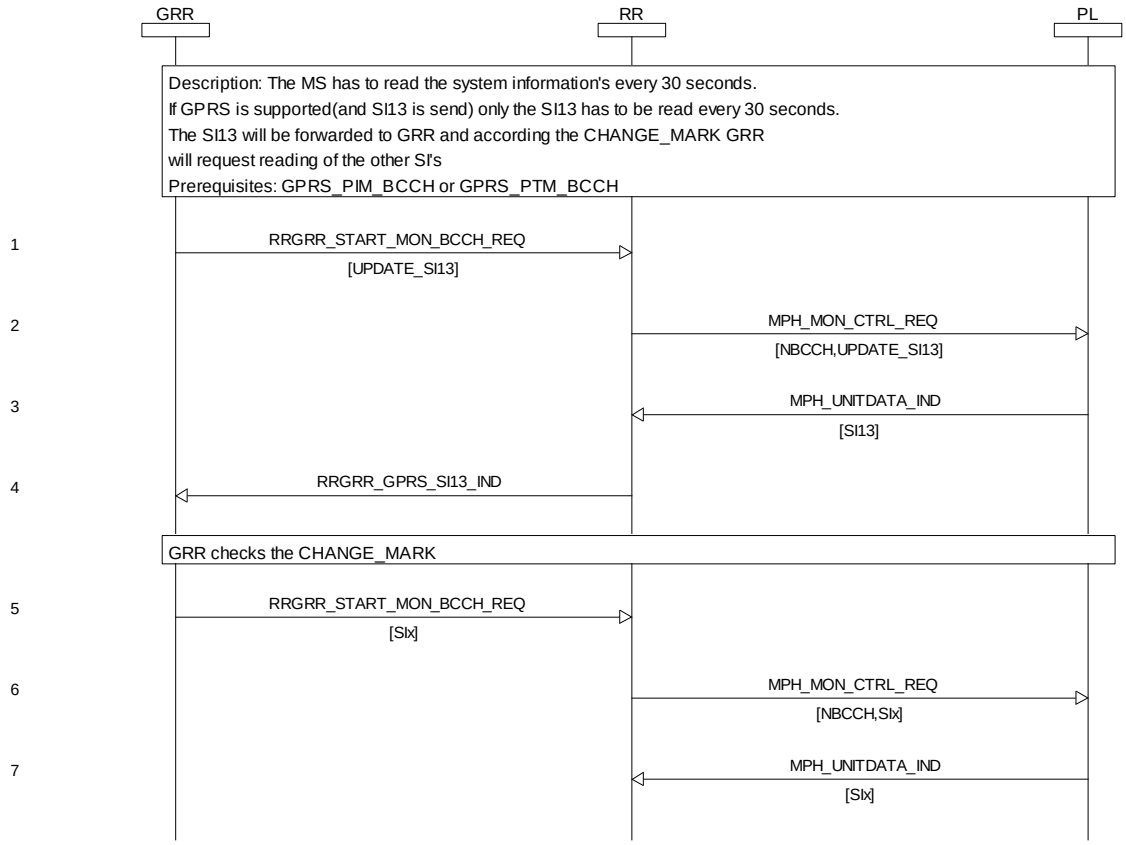


Figure 34 Periodic Serving Cell BCCH reading

2.7.2 Neighbourcell Procedures if no PBCCH available

2.7.3 Network Control Mode 0

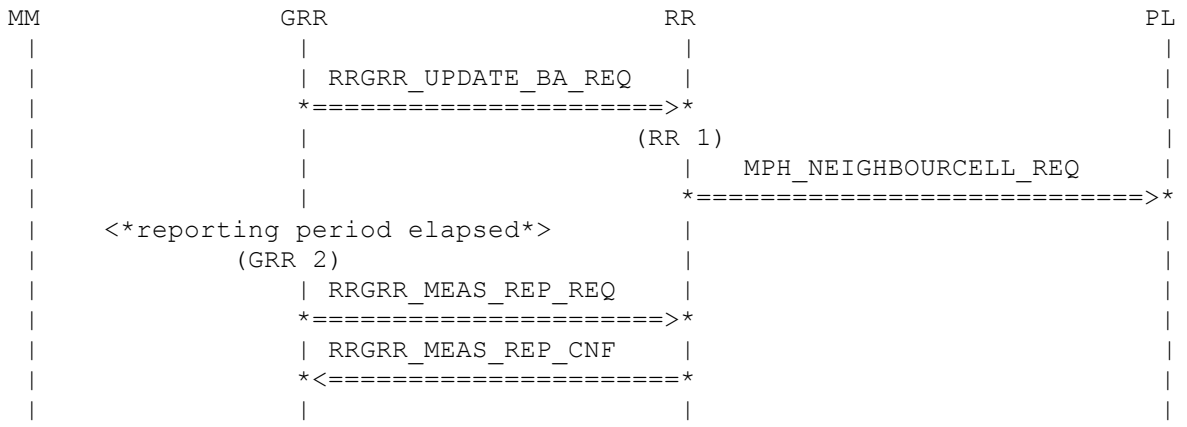
Description:

see RR and ALR Message Sequence Charts. Additionally the RA color and the READY state has to be taken into account for the CR decision.

2.7.4 Packet Measurement Order without Cell Reselection Parameters

Description:

GRR receives a PACKET MEASUREMENT ORDER and updates the BA list in RR. GRR requests the last measurement results for sending a PACKET MEASUREMENT REORT to the network. If the PMO contains no CR Parameters for the added cells RR does the cell reselection decision according to the C2 parameters. If the PMO contains CR Parameters for the added cells RR does the cell reselection decision according to the C31 parameters. When GRR needs to send the PACKET MEASUREMENT REPORT it requests the latest measurement results from RR. More on network controlled cell reselection in section 2.9



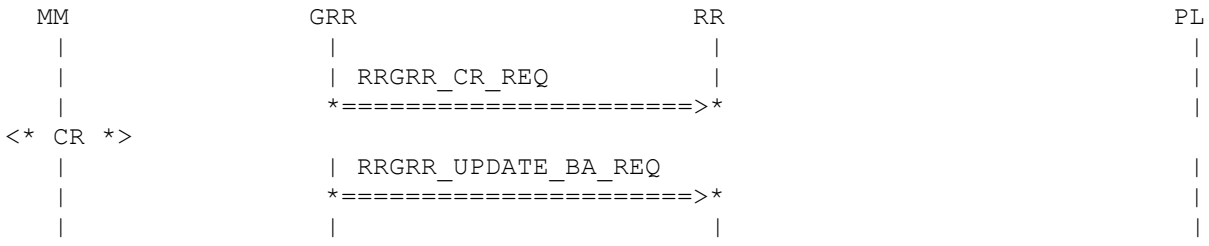
(RR 1)
RR receives the new removed and added cells and merges them with the current BA(BCCH) and configures PL with the resulting list.

(GRR 2)
The reporting period has elapsed and GRR needs to send the current measurements to the network.

2.7.5 Neighbour cells in Packet Cell Change Order

Description:

GRR receives a PACKET CELL CHANGE ORDER and updates RR with the additional BA frequencies for the new cell. GRR requests the cell reselection. RR does the cell reselection. If the PCCHO contains no CR Parameters for the added cells RR does the cell reselection decision according to the C2 parameters in the new cell. If the PCCHO contains CR Parameters for the added cells RR does the cell reselection decision according to the C31 parameters in the new cell. The Packet Cell Change Order procedure is described in section 2.10



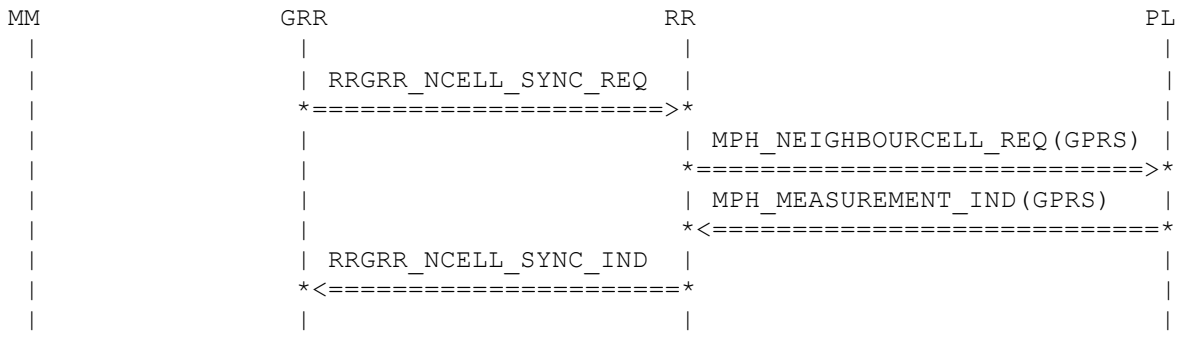
2.7.6 Neighbourcell Procedures if PBCCH available

Description:

GRR needs the following information and functionality from RR regarding the neighbourcells:

- If a ncell is a possible candidate see if it can be synchronized to at all.
- If a initial synchronization is possible, provide GRR with the BSIC of the ncell and store the position of the ncell relative to the scell in order to speed up a possible cell reselection.
- Periodically (10sec) confirm the synchronization of the ncell and check if the BSIC has changed and update the stored timing information.
- The initial synchronization has to be as fast as possible.

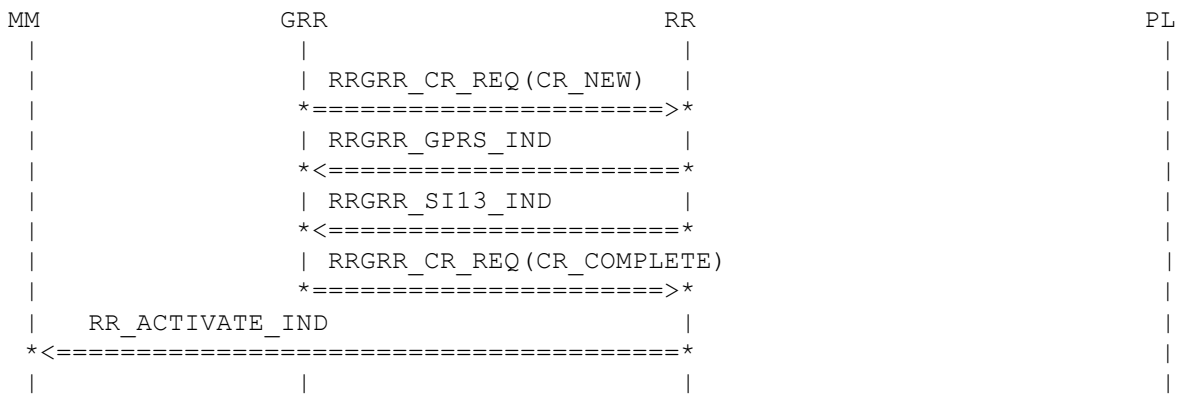
For the LCS service using E-OTD the MS has to measure and calculate the relative position of up to 12 ncells to the current serving cell. This is done by synchronizing to the ncell, fom this the relative position can be calculated. In order to reduce the error in calculating the position (eg. due to movement) these measurements have to be done every 10 seconds and they have to be done as fast as possible when requested. Therefore only ncells can be used for which a initial synchronization has already been done and the ncells have to be configured in Layer 1 with one primitive to allow Layer 1 to order the ncells to allow synchronization to be as fast as possible.



2.7.7 PBCCH is released on cell

Description:

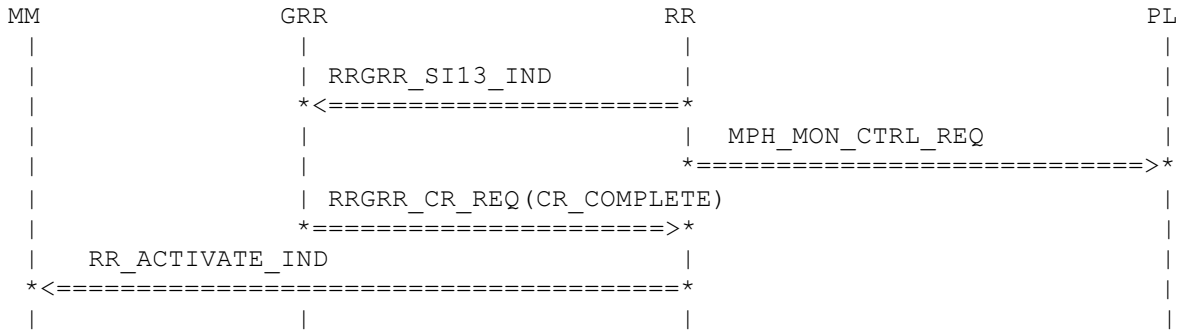
GRR is in packet idle/transfer mode on a PBCCH cell, the PBCCH is released by the network. This handled by GRR with a cell reselection to the same cell. This will lead to a acquisition of the BCCH.



2.7.8 PBCCH is activated on a cell

Description:

GRR/RR is in packet idle on a BCCH cell, the PBCCH is activated by the network.



2.7.9 Cell Reselection / scell BCCH / target cell no GPRS support / successful

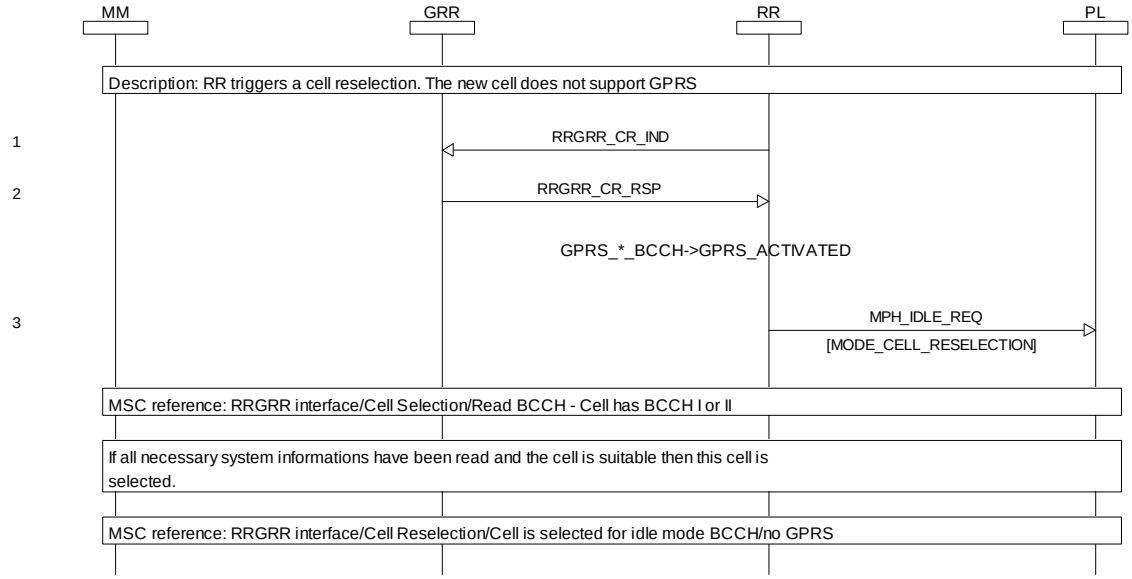


Figure 35 Cell Reselection / scell BCCH / target cell no GPRS support / successful

2.7.10 Cell Reselection / scell BCCH / failure

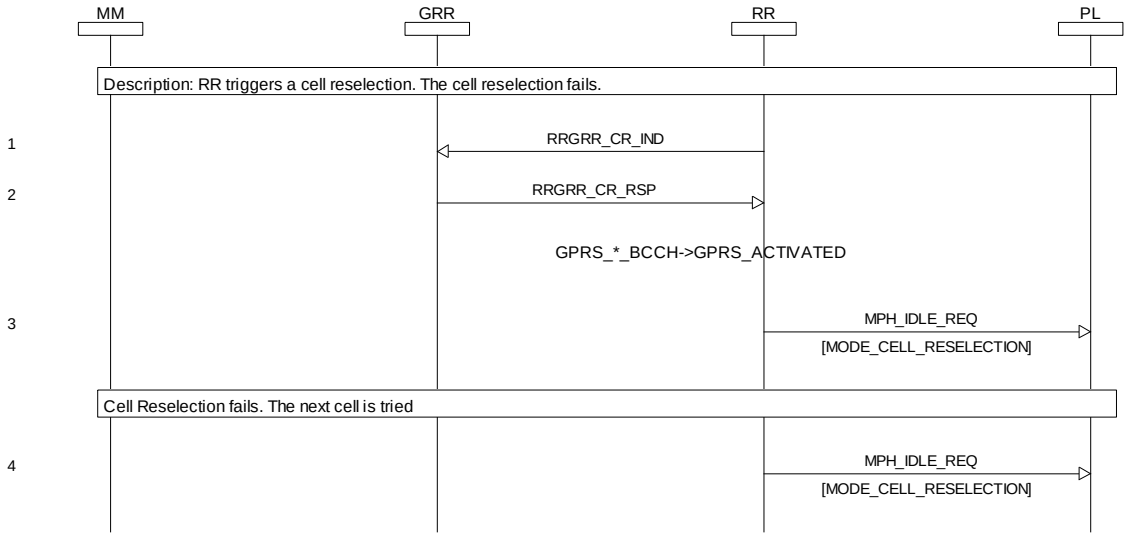


Figure 36 Cell Reselection / scell BCCH / failure

2.7.11 Cell Reselection / scell BCCH / target cell GPRS support, BCCH / successful

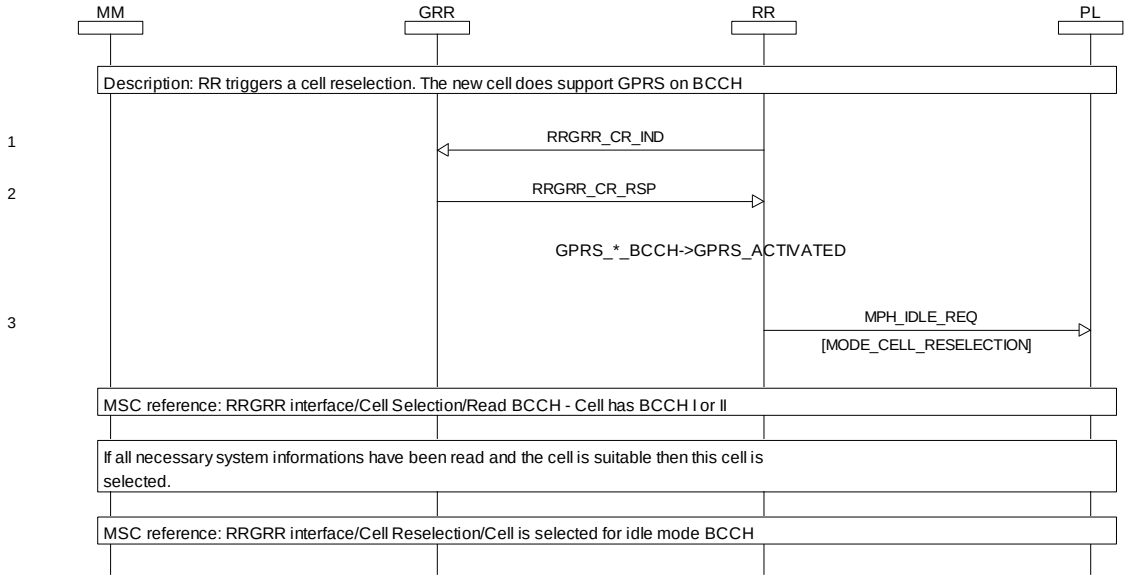


Figure 37 Cell Reselection / scell BCCH / target cell GPRS support, BCCH / successful

2.7.12 Cell Reselection / scell BCCH / target cell PBCCH / successful

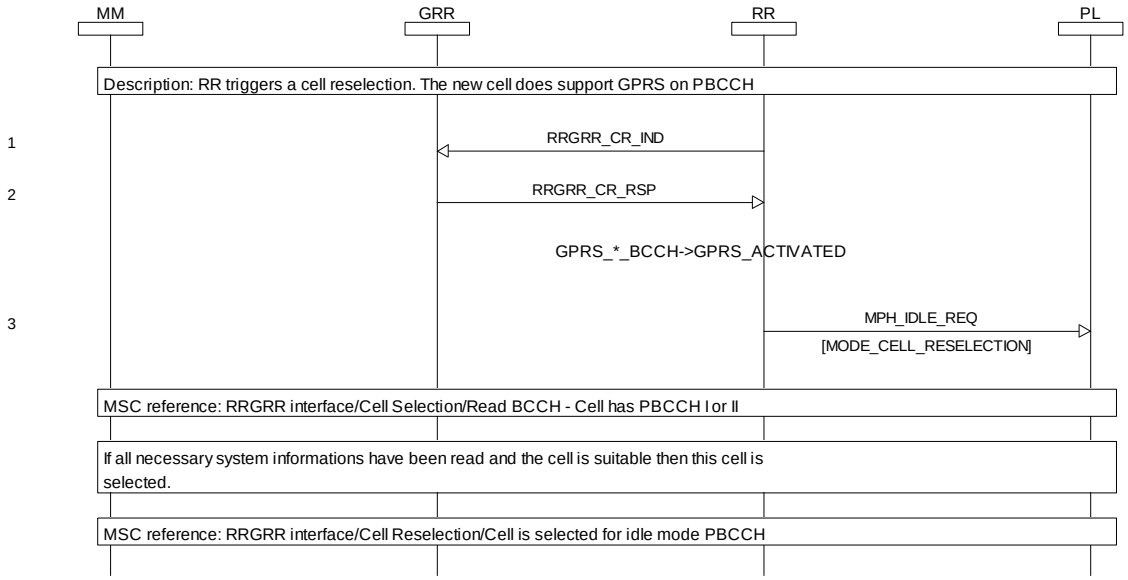


Figure 38 Cell Reselection / scell BCCH / target cell PBCCH / successful

2.7.13 Cell Reselection / scell BCCH / target cell PBCCH / failure

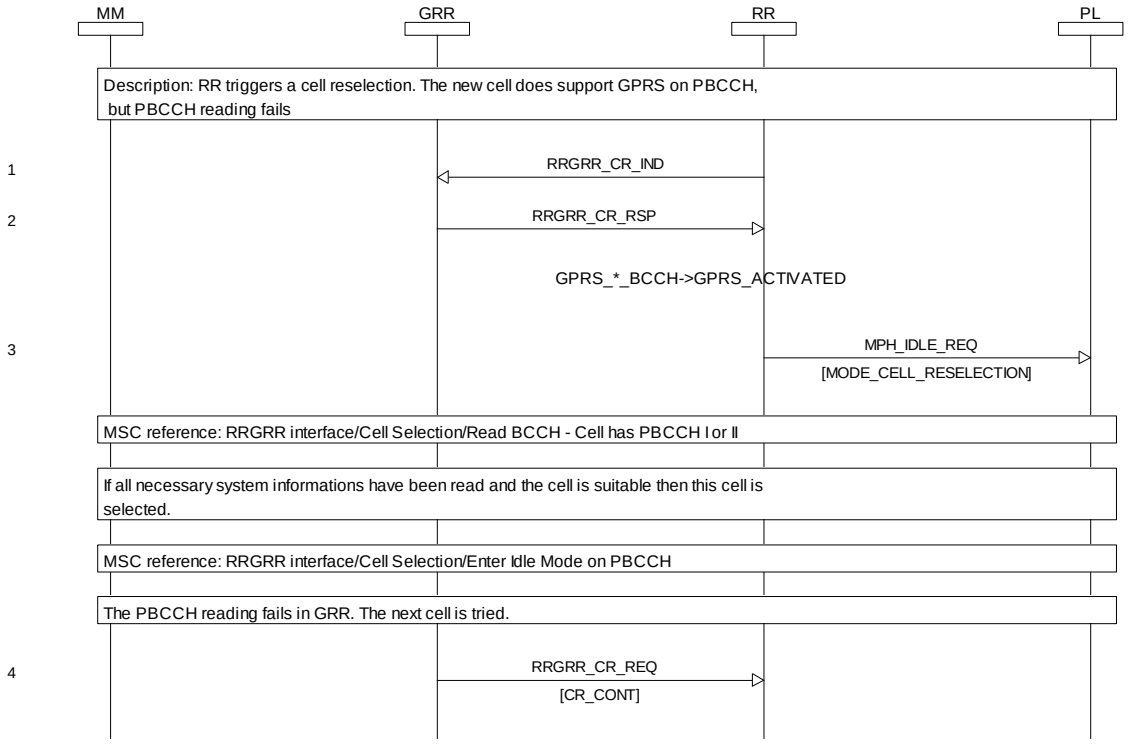


Figure 39 Cell Reselection / scell BCCH / target cell PBCCH / failure

2.7.14 Cell Reselection / scell PBCCH / target cell BCCH / no GPRS support

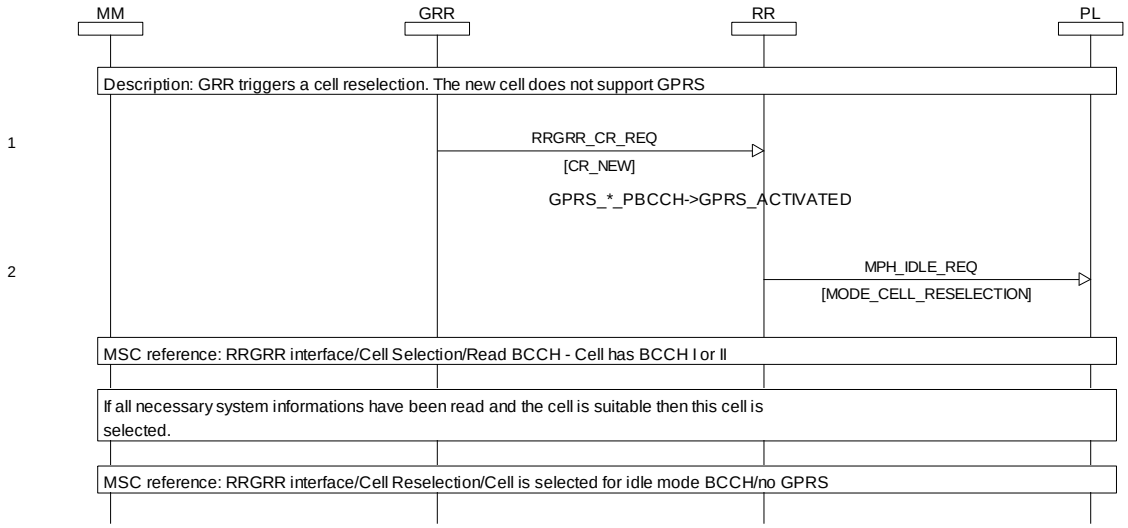


Figure 40 Cell Reselection / scell PBCCH / target cell BCCH / no GPRS support

2.7.15 Cell Reselection / scell PBCCH / target cell PBCCH / successful

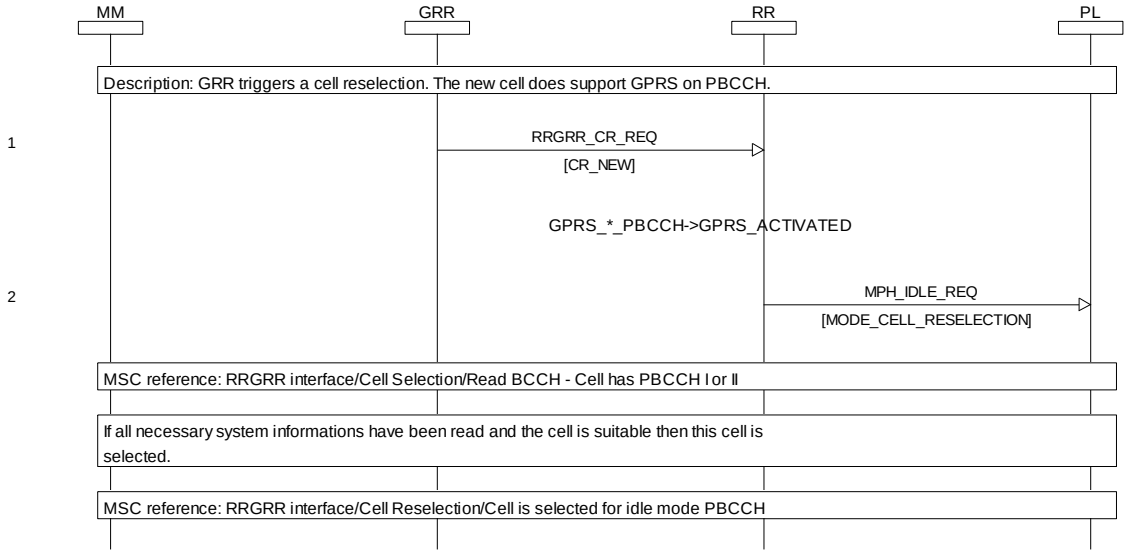


Figure 41 Cell Reselection / scell PBCCH / target cell PBCCH / successful

2.7.16 Cell Reselection / scell PBCCH / target cell BCCH/ success

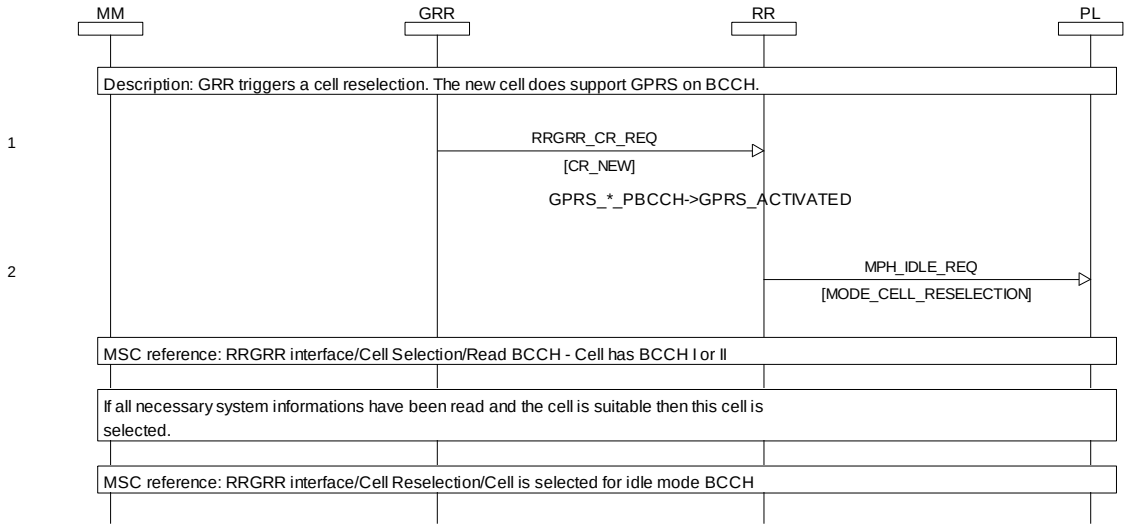


Figure 42 Cell Reselection / scell PBCCH / target cell BCCH/ success

2.7.17 Cell Reselection / scell PBCCH / failure

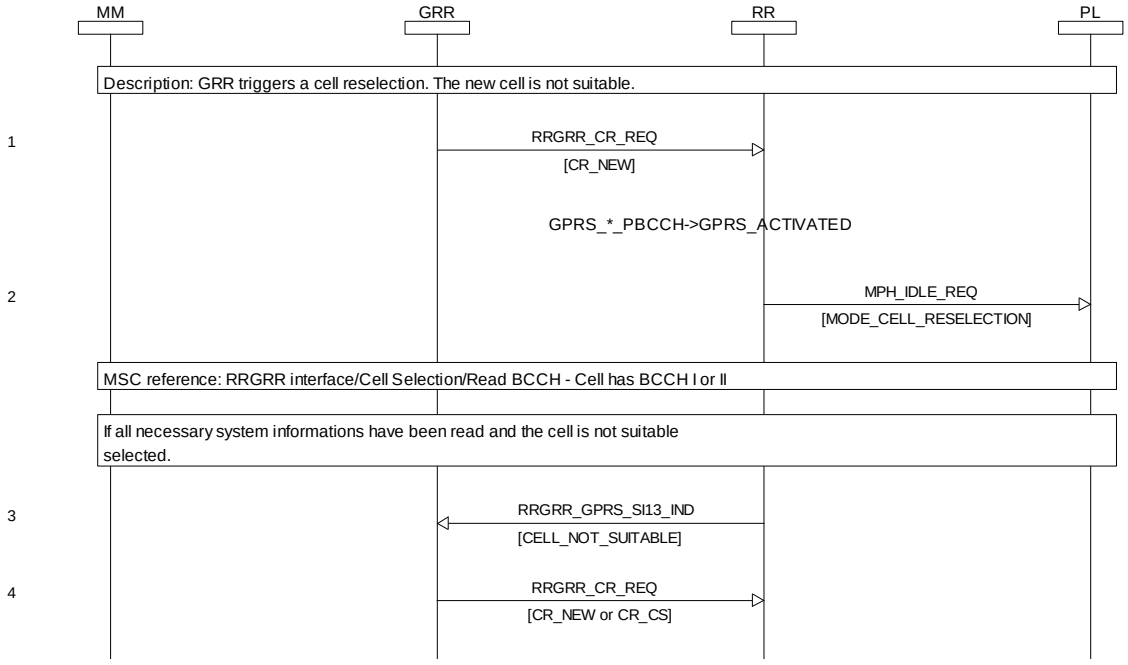


Figure 43 Cell Reselection / scell PBCCH / failure

2.7.18 Cell Reselection / scell PBCCH / target cell not synced

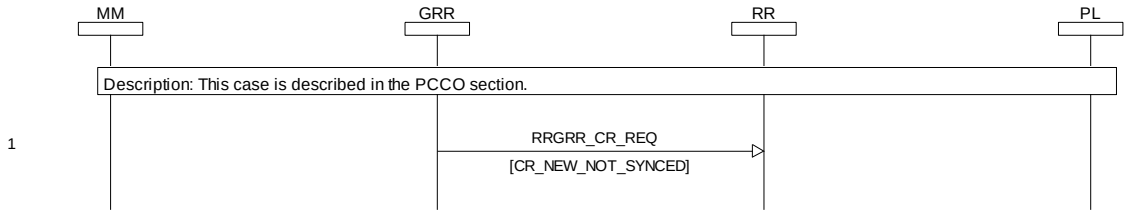


Figure 44 Cell Reselection / scell PBCCH / target cell not synced

2.7.19 Cell Reselection / Enter Idle Mode on BCCH – GPRS available

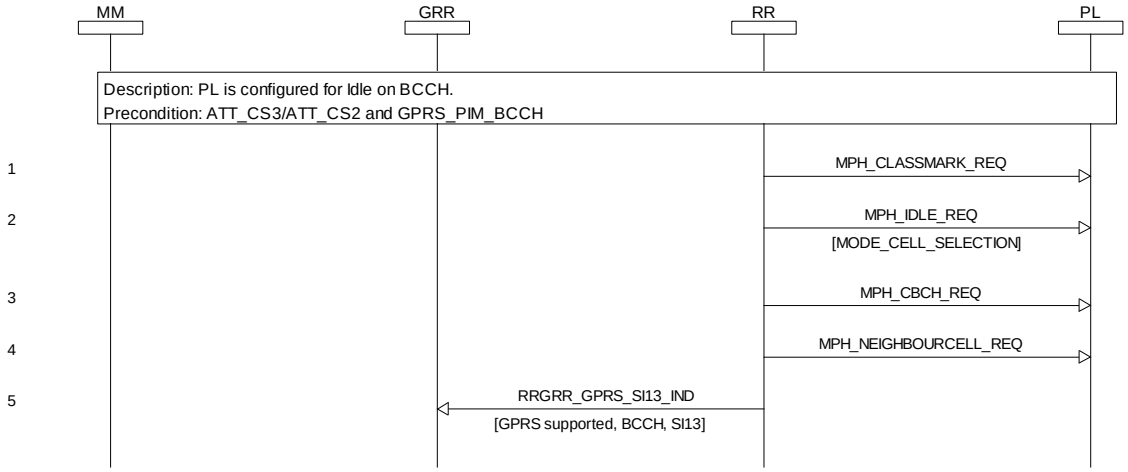


Figure 45 Cell Reselection / Enter Idle Mode on BCCH – GPRS available

2.7.20 Cell Reselection / cell is selected for idle mode – no GPRS

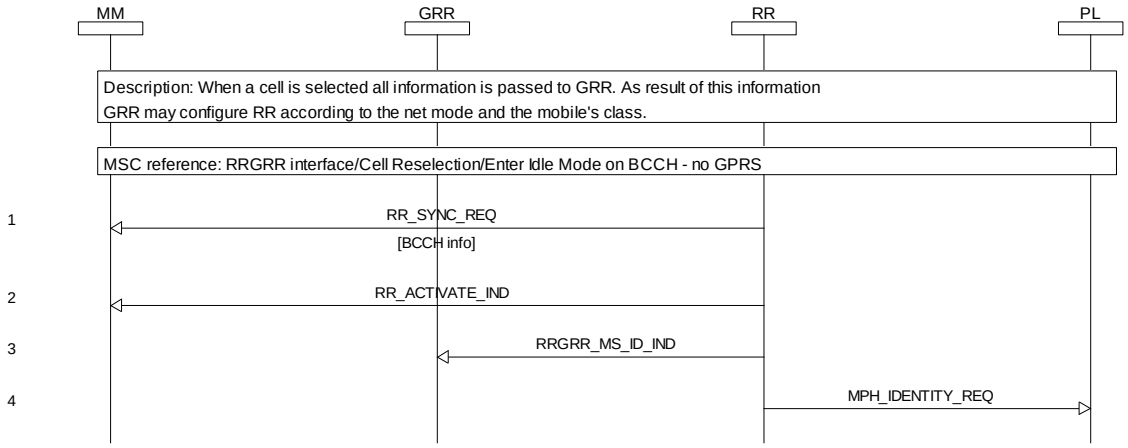


Figure 46 Cell Reselection / cell is selected for idle mode – no GPRS

2.7.21 Cell Reselection / Enter idle mode on BCCH – no GPRS available

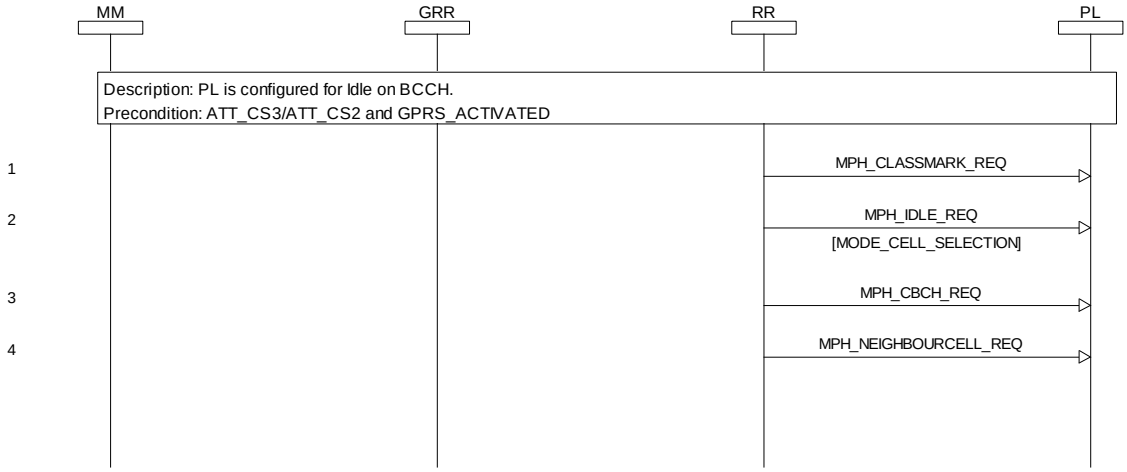


Figure 47 Cell Reselection / Enter idle mode on BCCH – no GPRS available

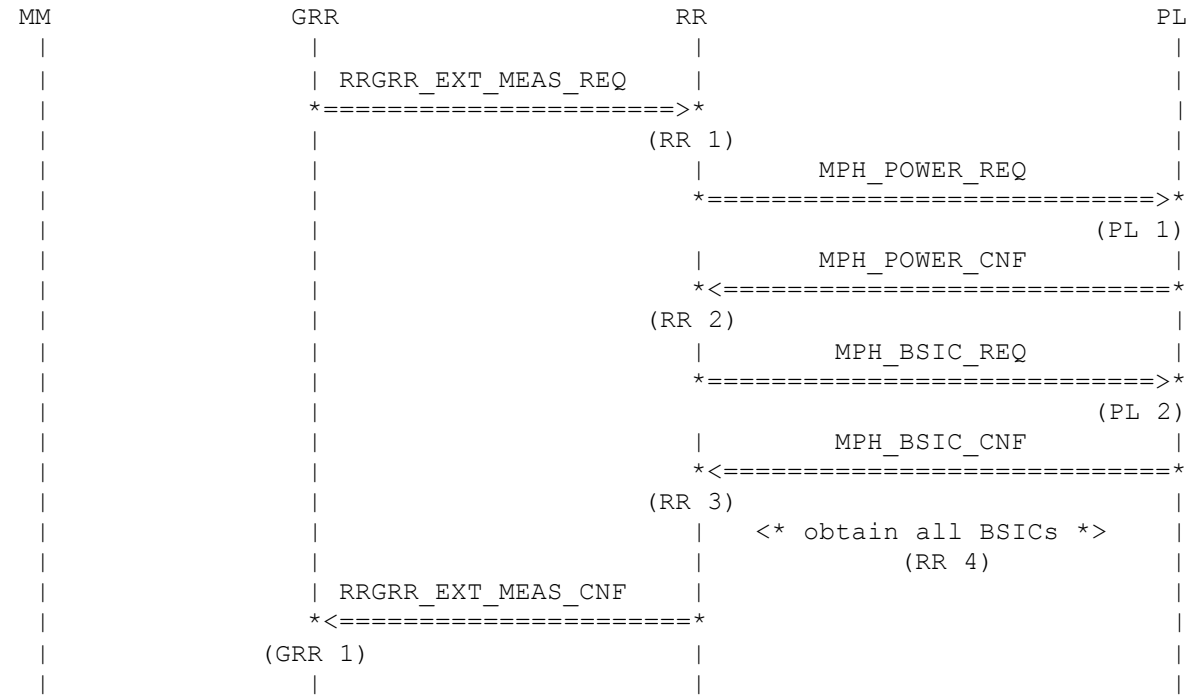
2.8 Packet Idle Mode Procedures

If the MS is in STANDBY state and PACKET IDLE state the network does not control the measurements and cell reselection with the PACKET MEASUREMENT ORDER and CELL CHANGE ORDER. In this case only EXTENDED MEASUREMENT ORDER is used.

2.8.1 Extended Measurement, normal case

Description:

The system is in Packet Idle Mode. The Network has requested to periodically perform the Extended Measurements. The entity GRR is the main executing subsystem during this procedure. GRR requests RR to perform the actual measurements. The Extended Measurement procedure has lower priority than the Cell Reselection procedure. Therefore RR handles requests affecting Cell Reselection with higher priority than Extended Measurement.



(RR 1)
GRR periodically (interval EXT_REPORTING_PERIOD) requests RR to initate the measurements for the Extended Measurement procedure. The interval EXT_REPORTING_PERIOD is a system value transmitted in a Packet System Information Type 5 message or it is provided individually to a MS in a Packet Measurement Order message. The primitive RRGRR_EXT_MEAS_REQ contains the ARFCNs on which the measurements should be performed. Furthermore GRR can request RR to limit the measurements according to system parameter EXT_REPORTING_TYPE.

(PL 1)
RR requests PL to perform a field strength measurement.

(RR 2)
PL provides the results of the field strength measurements to RR.

(PL 2)
RR requests PL to synchronize to the SCH of the first channel.

(RR 3)
PL provides the BSIC of the first channel to RR.

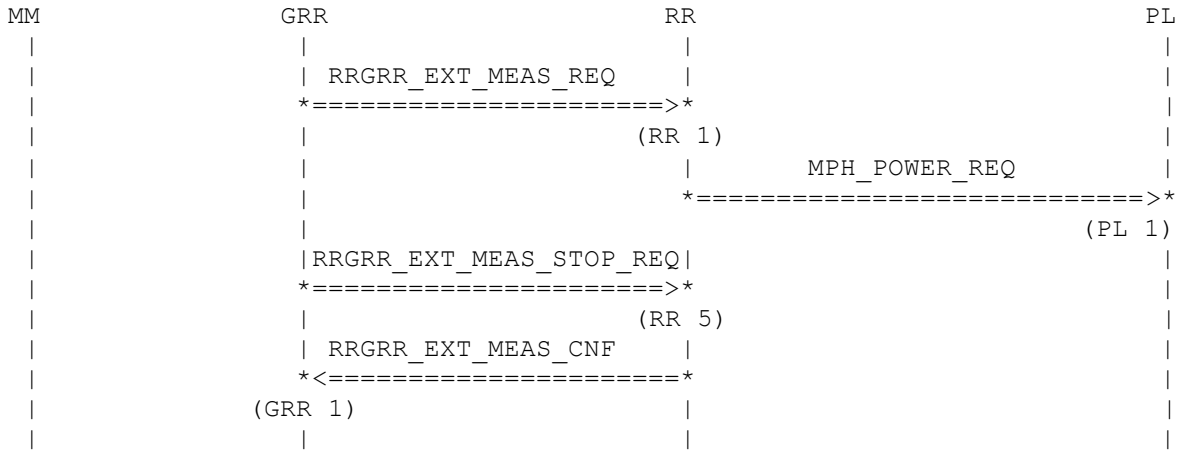
(RR 4)
RR requests PL to provide the BSICs of the remaining channels. PL synchronizes to these channels and returns the BSICs to RR. For each channel a pair of MPH_BSIC_REQ / MPH_BSIC_CNF primitives are transmitted between RR and PL.

(GRR 1)
RR sends the measuement results, field strengths and BSICs, to GRR.

2.8.2 Extended Measurement, premature end of procedure

Description:

The Extended Measurement procedure is started on request from GRR. However before the procedure comes to an end, GRR stops the Extended Measurement procedure.



(RR 1)
GRR starts the Extended Measurement procedure at RR.

(PL 1)
RR requests PL to perform a field strength measurement.

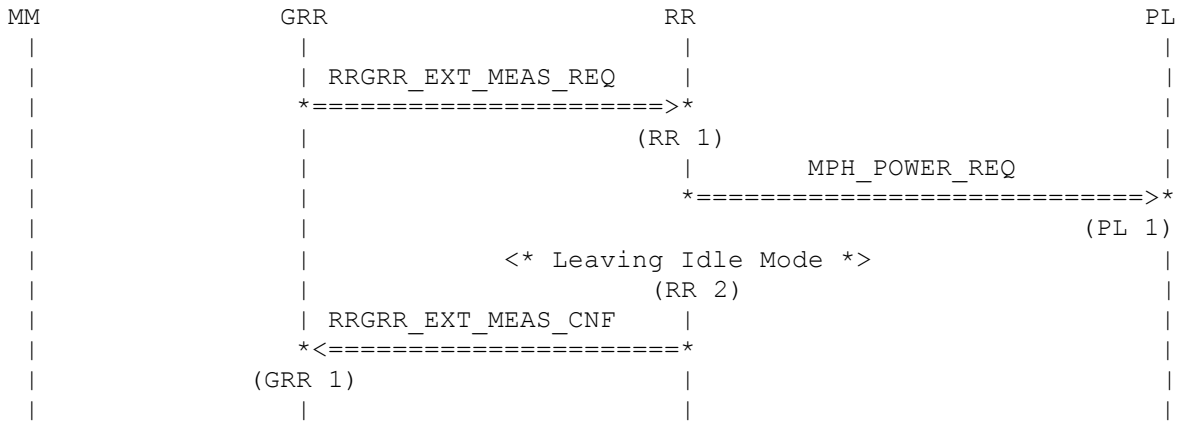
(RR 5)
GRR requests RR to stop the Extended Measurment procedure. This is typically done when the Packet Transfer Mode in entered.

(GRR 1)
RR confirms to GRR the end of the Extended Measurement procedure. The list containing the measurement results has zero length.

2.8.3 Extended Measurement, leaving Idle Mode

Description:

The Extended Measurement procedure is started on request from GRR. However before the procedure comes to an end, a Cell Reselection procedure is initiated which has higher priority than the Extended Measurement procedure. Therefore the Extended Measurement procedure is stopped.



(RR 1)
GRR starts the Extended Measurement procedure at RR.

(PL 1)
RR requests PL to perform a field strength measurement.

(RR 2)
RR leaves the Idle Mode, e.g. due to the start of a Cell Reselection procedure.
(GRR 1) RR confirms to GRR the unsuccessful end of the Extended Measurement procedure. The list containing the measurement results has zero length.

2.9 Network controlled cell reselection with BCCH

This section describes the network controlled cell reselection procedure. The relevant specifications are 4.60/5.08. This procedure only applies if the MS is READY state. When the cell supports GPRS the network can control the cell reselection behaviour of the MS with the parameter NETWORK_CONTROL_ORDER (which is transmitted to the MS via System Information 13 or Packet Measurement Order). The NETWORK_CONTROL_ORDER can have the following values: { NC0, NC1, NC2, RESET }.

- NC0: The MS can do autonomous cell reselection
- NC1: The MS has to send Packet Measurement Reports to NW but can do autonomous cell reselection
- NC2: The MS has to send Packet Measurement Reports to NW and the cell reselection is controlled by the NW with Packet Cell Change Order
- RESET: The default value in System Information 13 shall be used (This is only transmitted in Packet Measurement Order).

When a DSF or a RACH failure occurs the MS can do a cell reselection regardless of the NC mode. When the MS enters STANDBY state the MS can do autonomous cell reselection regardless of the previous NC mode.

The following primitives are used in this procedure:
1. RRGRR_STANDBY_STATE_IND - indicates STANDBY state
2. RRGRR_READY_STATE_IND - indicates READY state

3. RRGRR_UPDATE_BA_REQ - indicate the NC mode received in the Packet Measurement Order by GRR

The following figure tries to depict the possible configurations of NC mod, without READT/STANDBY state handling.

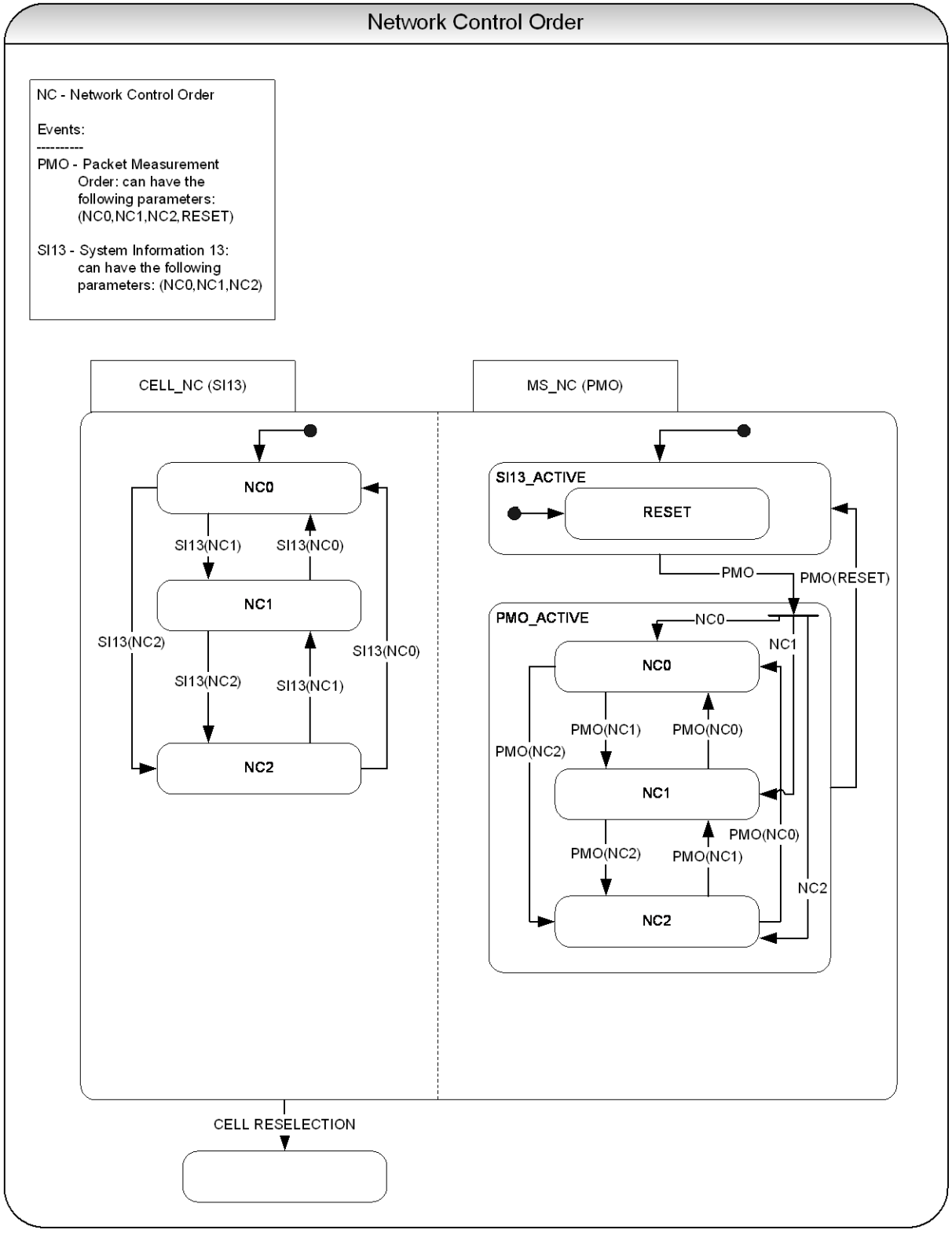


Figure 48 NC mode state machine

2.9.1 NC2 set in System Information 13

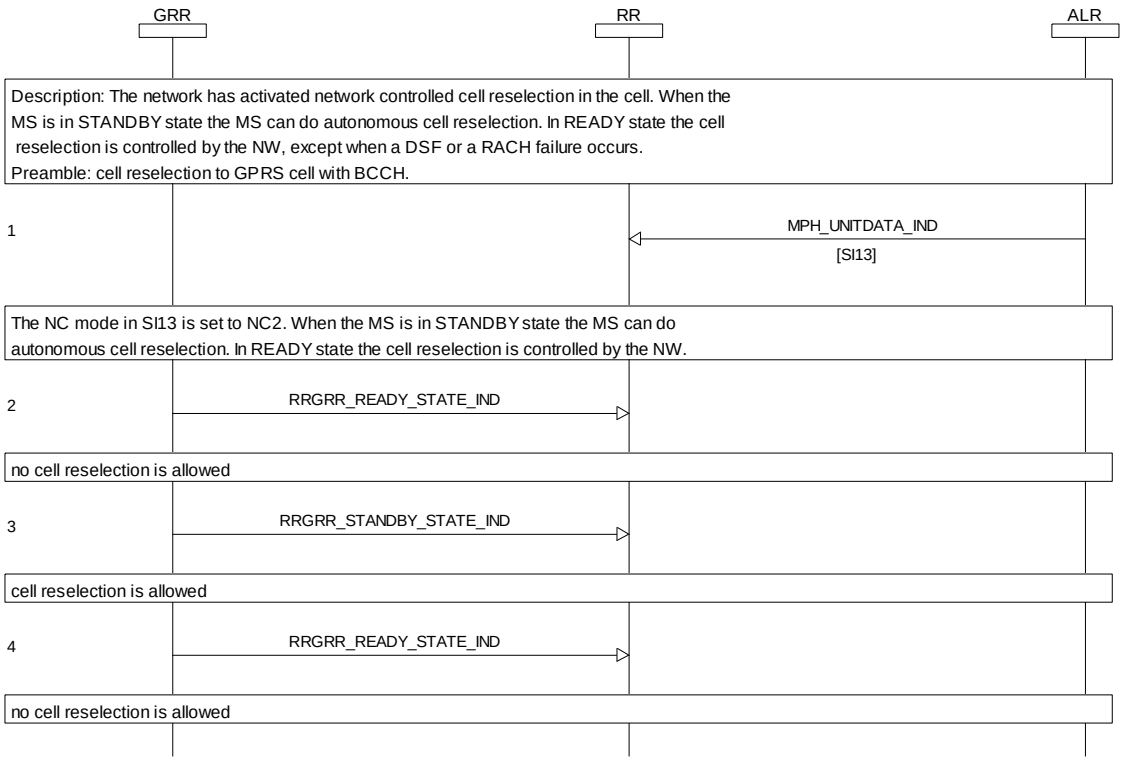


Figure 49: NC2 set in SI13

2.9.2 NC2 set in Packet Measurement Order

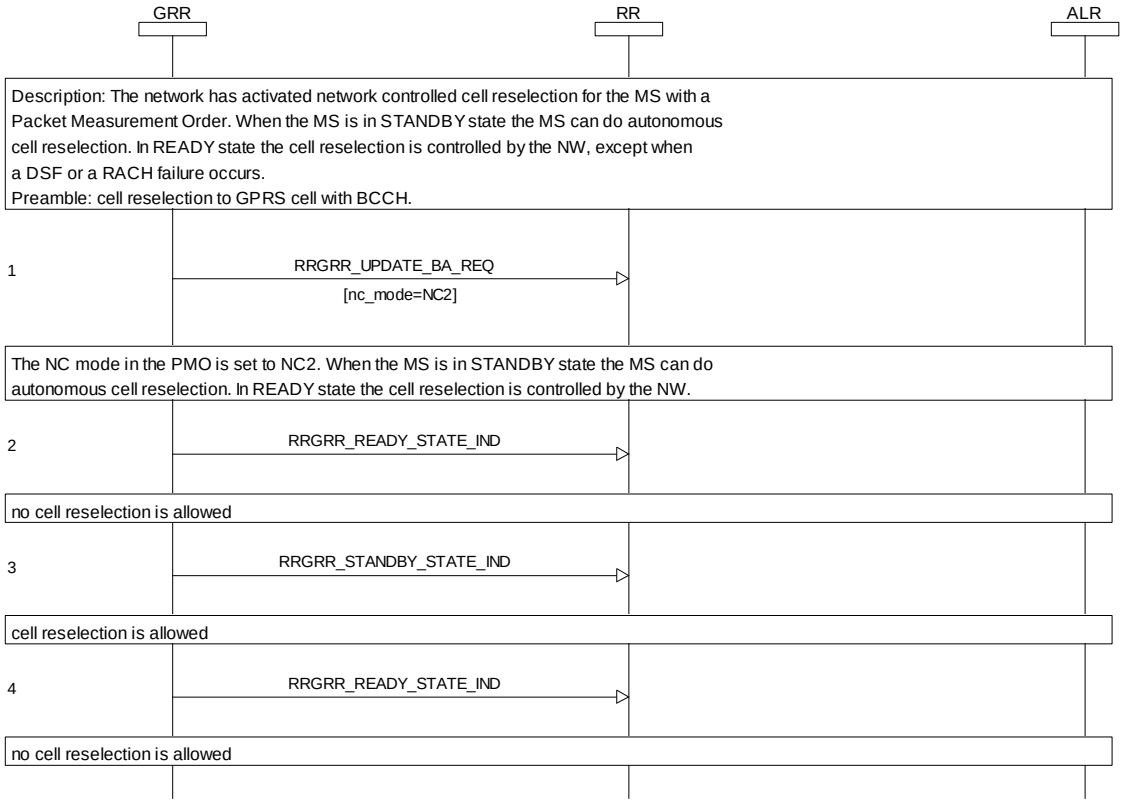


Figure 50: NC2 set in PMO

2.9.3 DSF/RACH failure in READY state with NC2

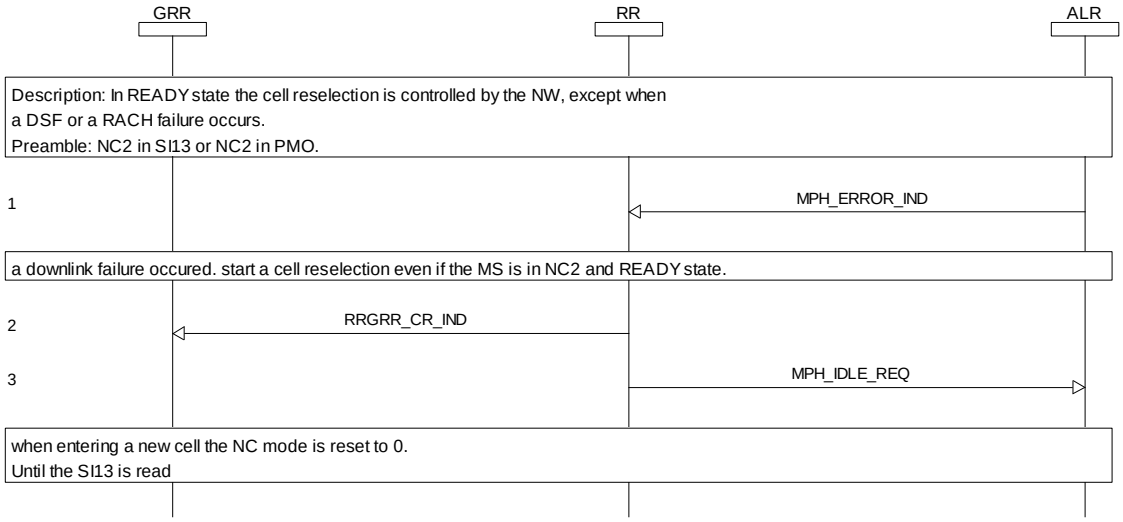


Figure 51: DSF failure in NC2

2.9.4 System Information 13 changes while NC2 is set from Packet Measurement Order

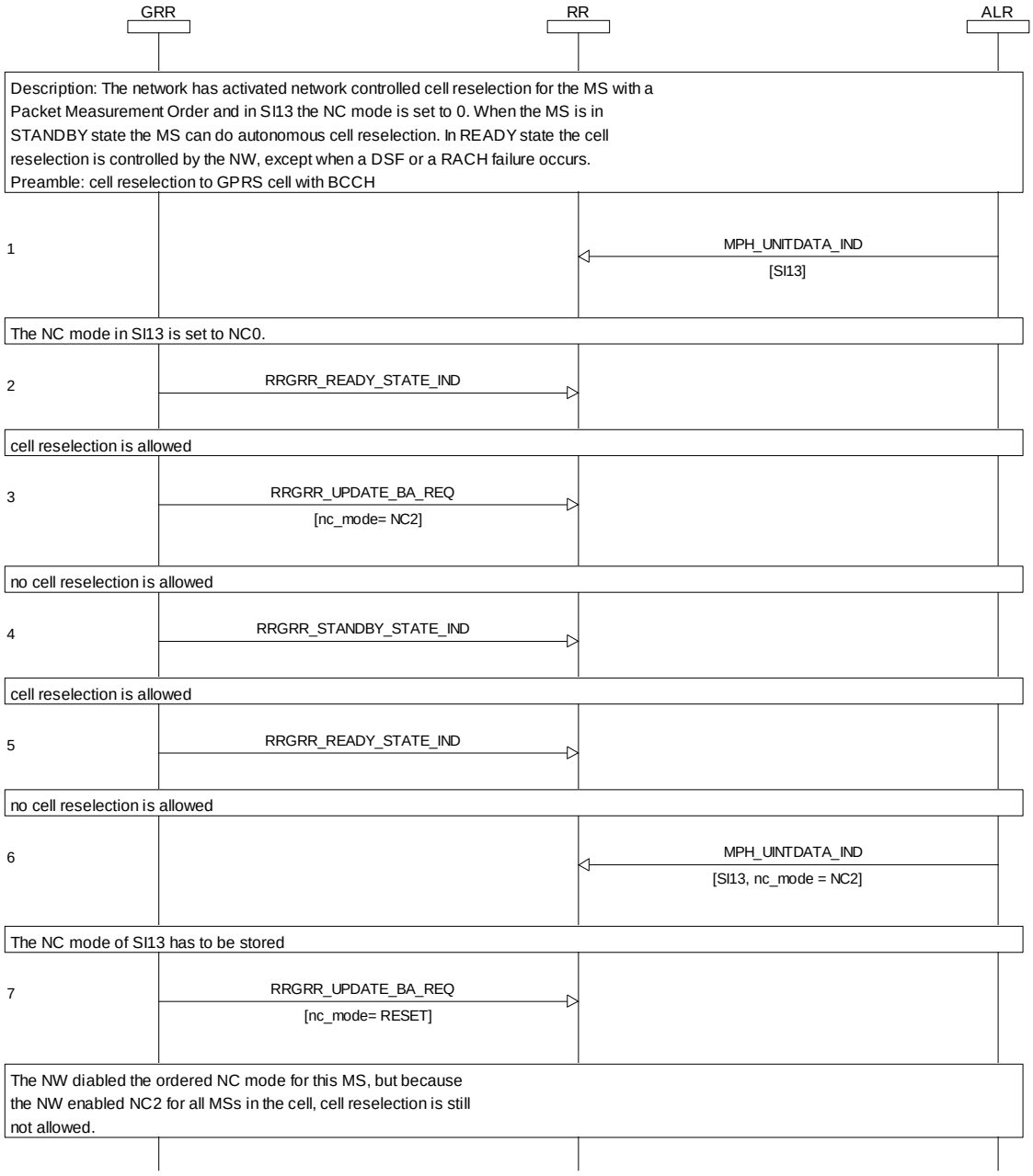


Figure 52: SI13 changes while NC2 from PMO is active

2.10 Packet Cell Change Order

If the MS is in READY state and receives a PACKET CELL CHANGE ORDER from the network to a cell which it is not synchronized to, it has to acquire sycnhronization before starting a normal cell reselection.

2.10.1 Packet Cell Change Order / successful case

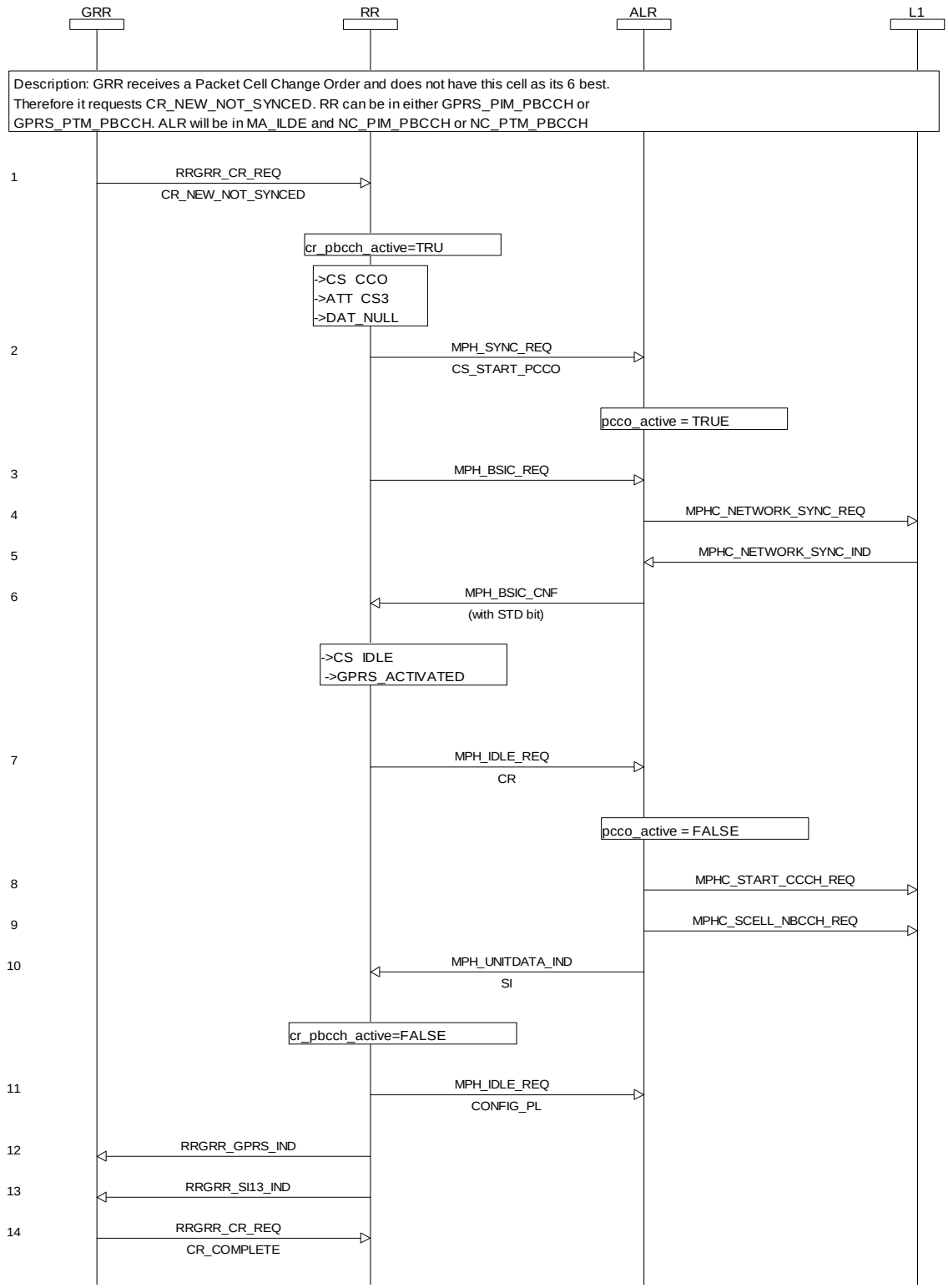


Figure 53 Packet Cell Change Order - successful

2.10.2 Packet Cell Change Order / failure case / synchronization failed

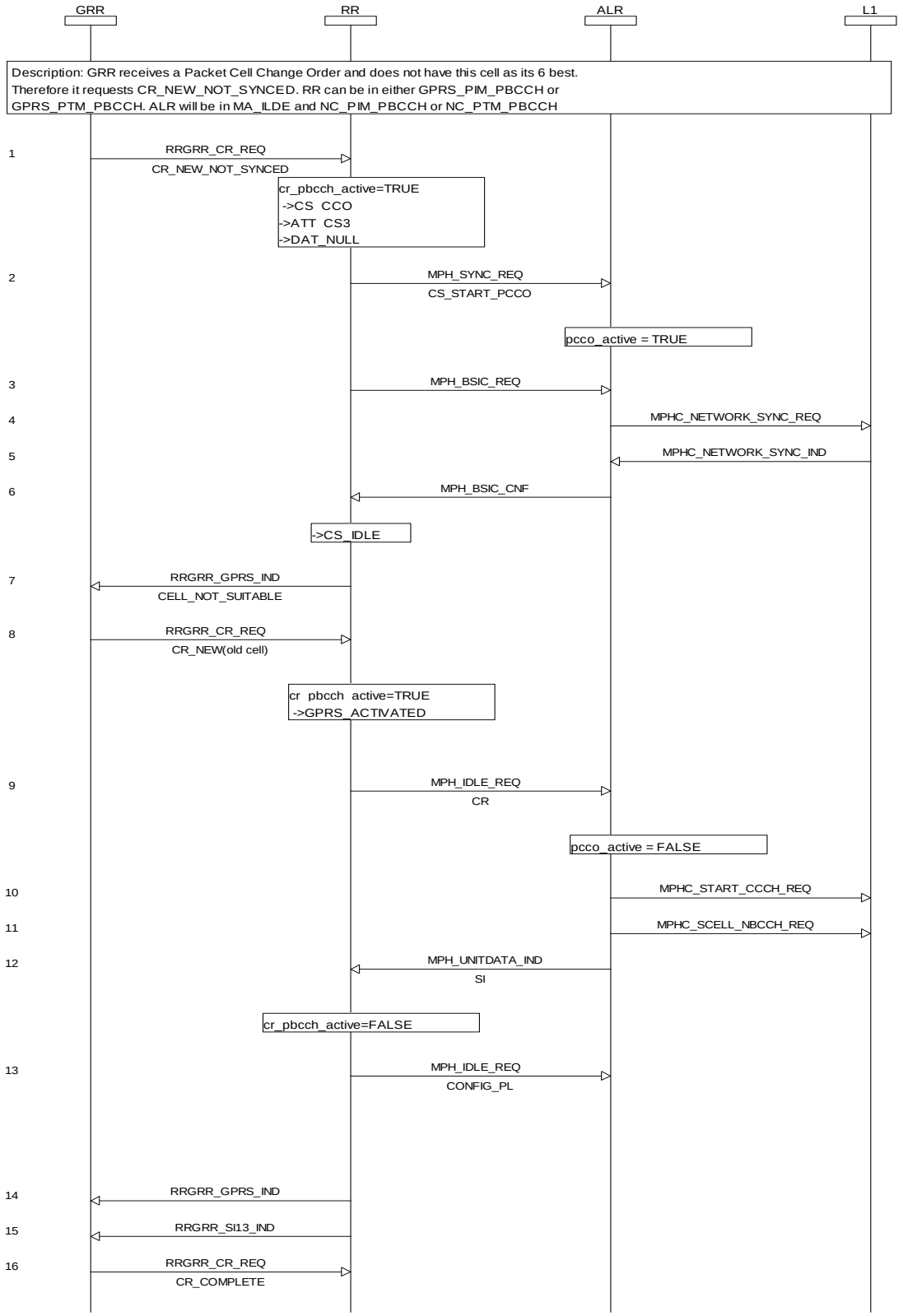


Figure 54 Packet Cell Change Order / failure case / sync failed

2.10.3 Packet Cell Change Order / failure case / BCCH reading failed

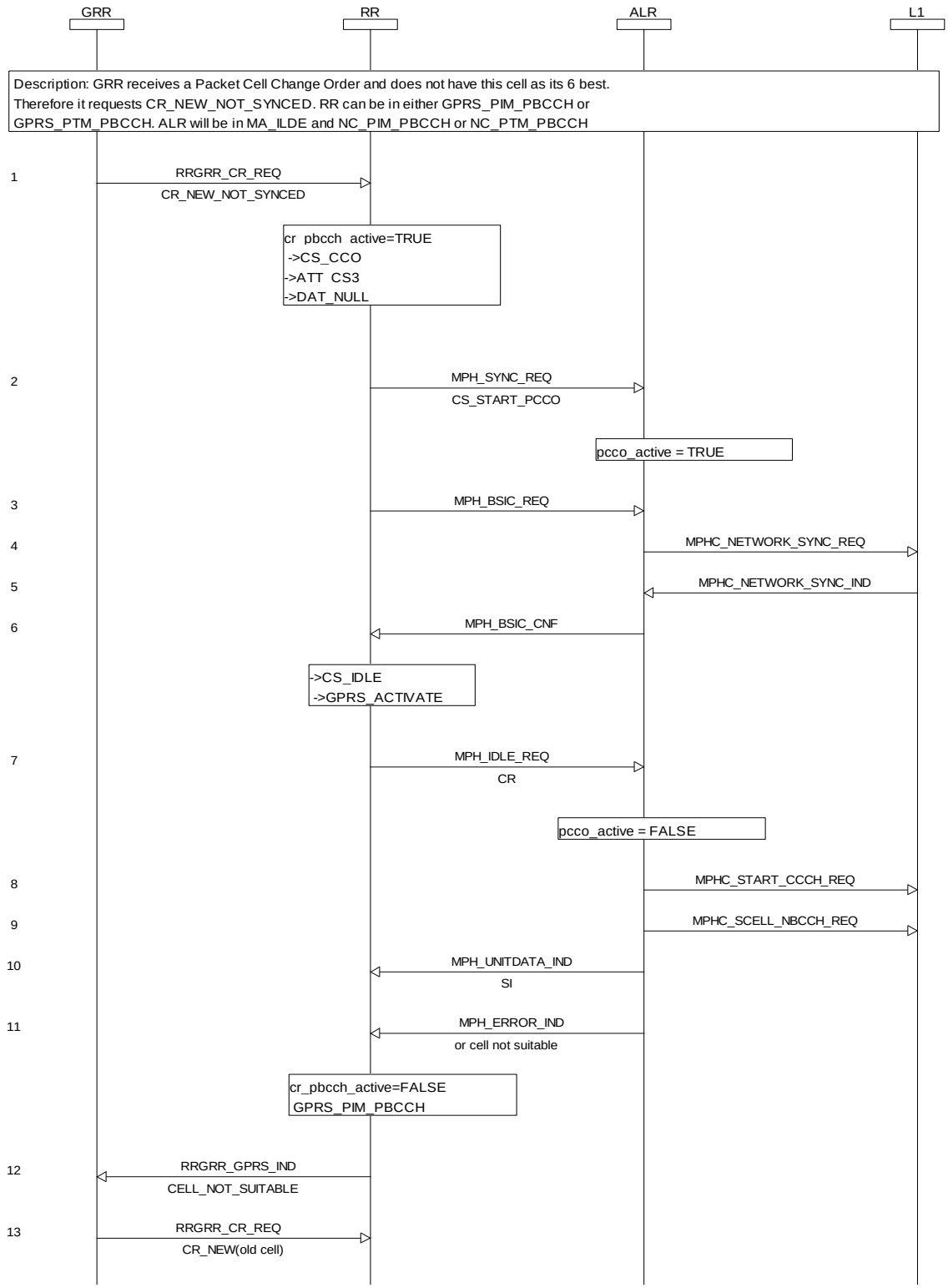


Figure 55 Packet Cell Change Order/ failure case/BCCH reading failed

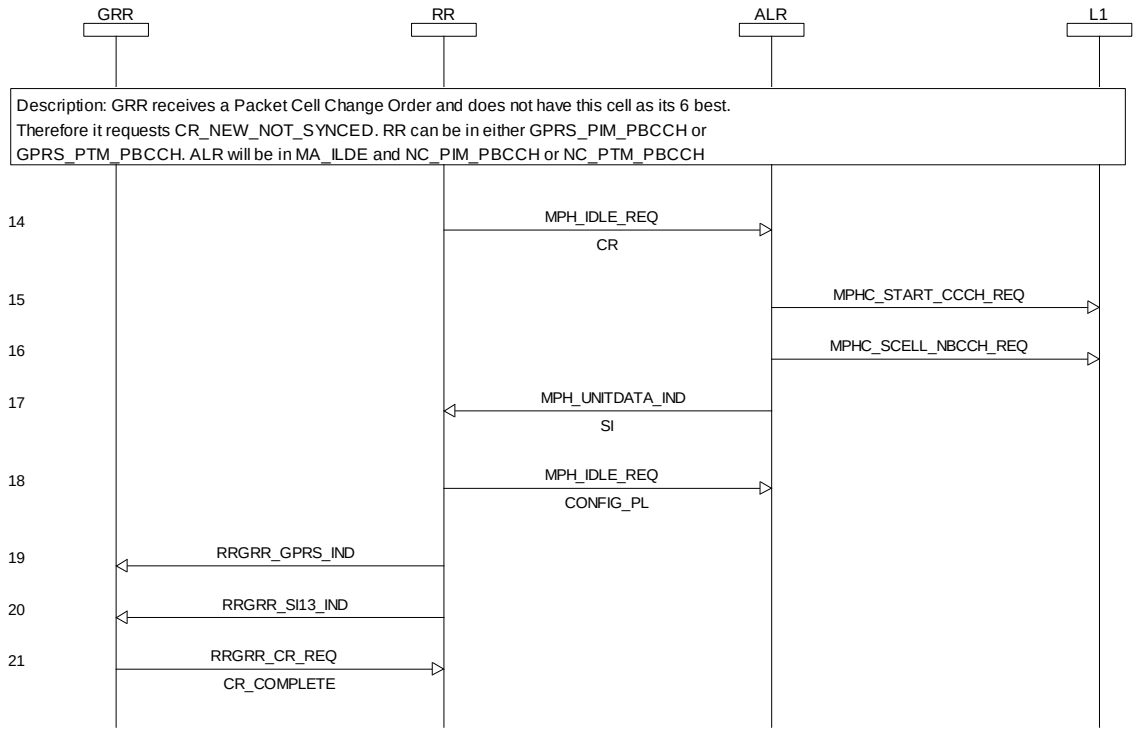


Figure 56 BCCH reading failed continued

2.10.4 PCCO received in SCELL without PBCCH / Success

Figure 57 PCCO received in SCELL without PBCCH / Success

2.10.5 PCCO received in SCELL without PBCCH / Failure / Back to old SCELL

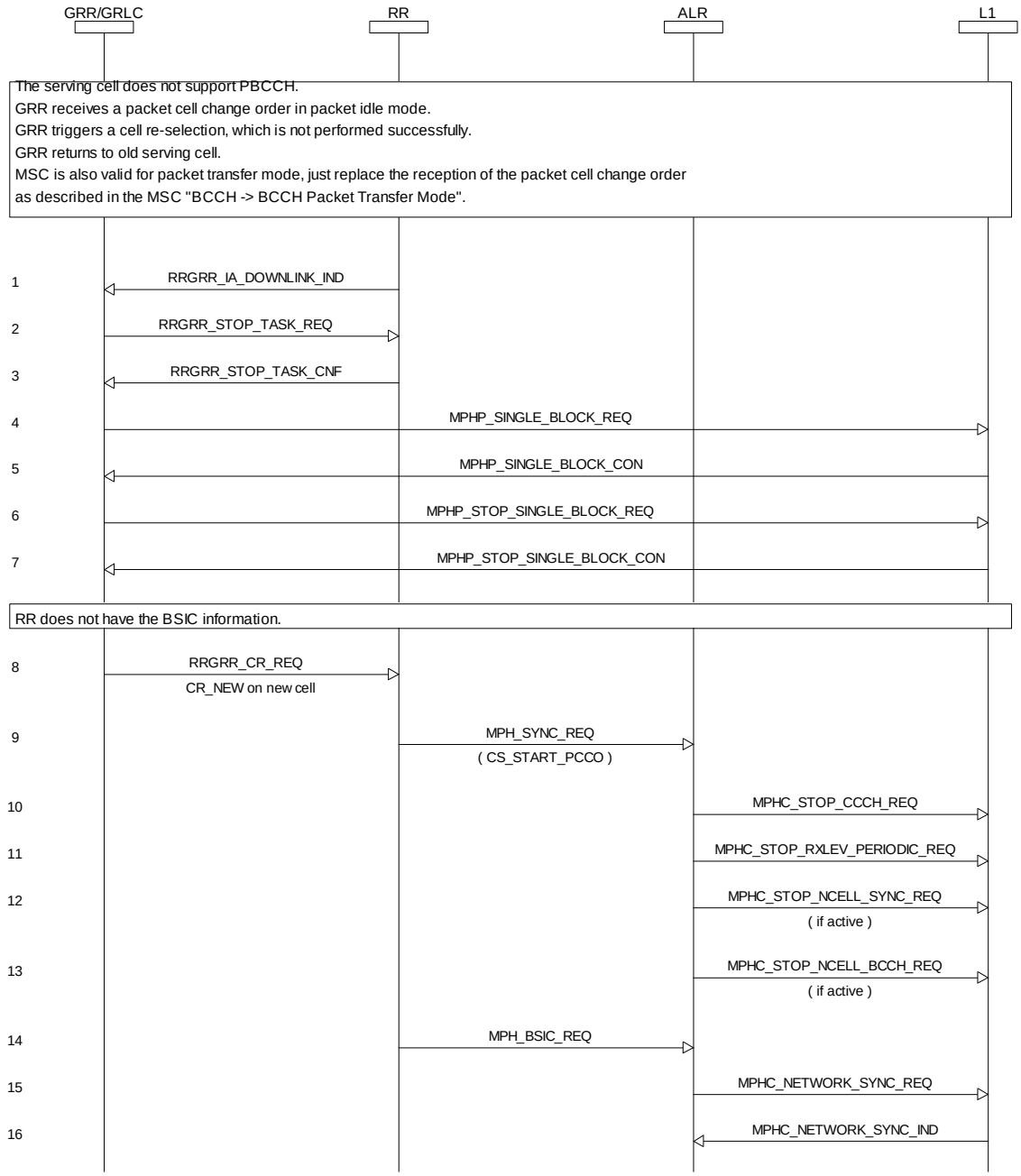


Figure 58 PCCO received in SCELL without PBCCH / Failure / Back to old SCELL

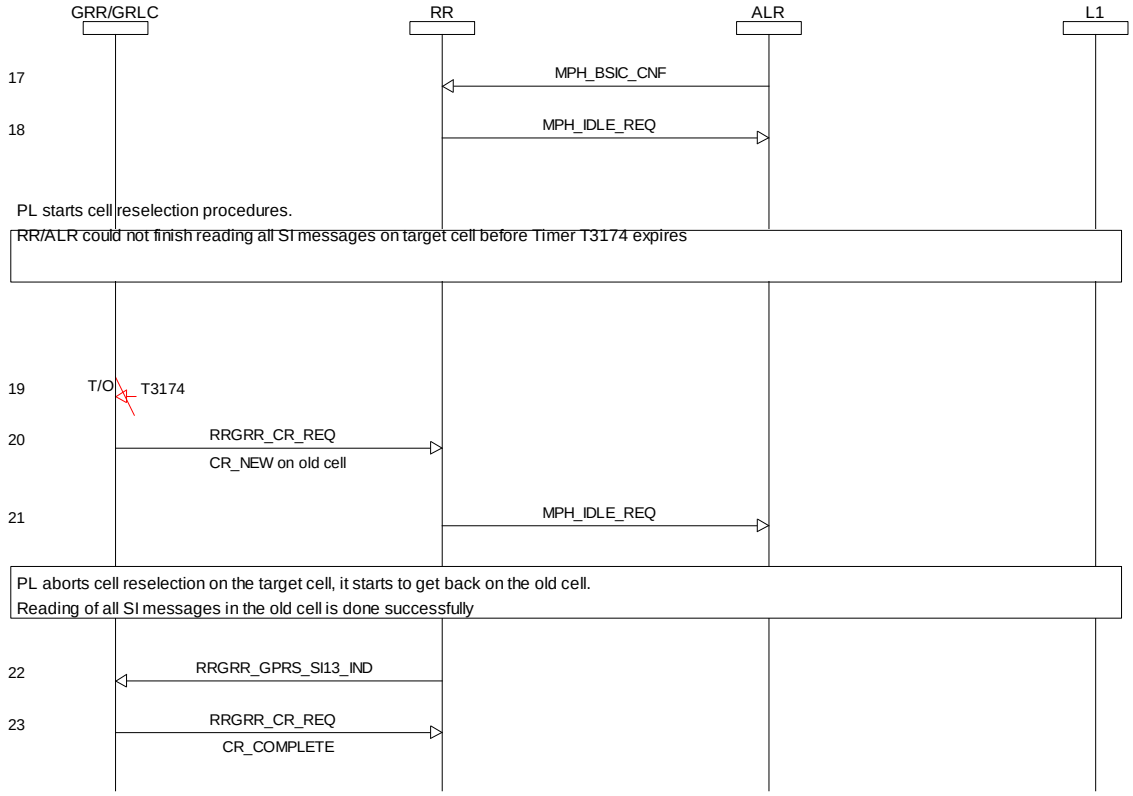


Figure 59 PCCO received in SCELL without PBCCH / Failure / Back to old SCELL - Continued

2.10.6 PCCO received in SCELL without PBCCH / Failure / Cell Selection Started

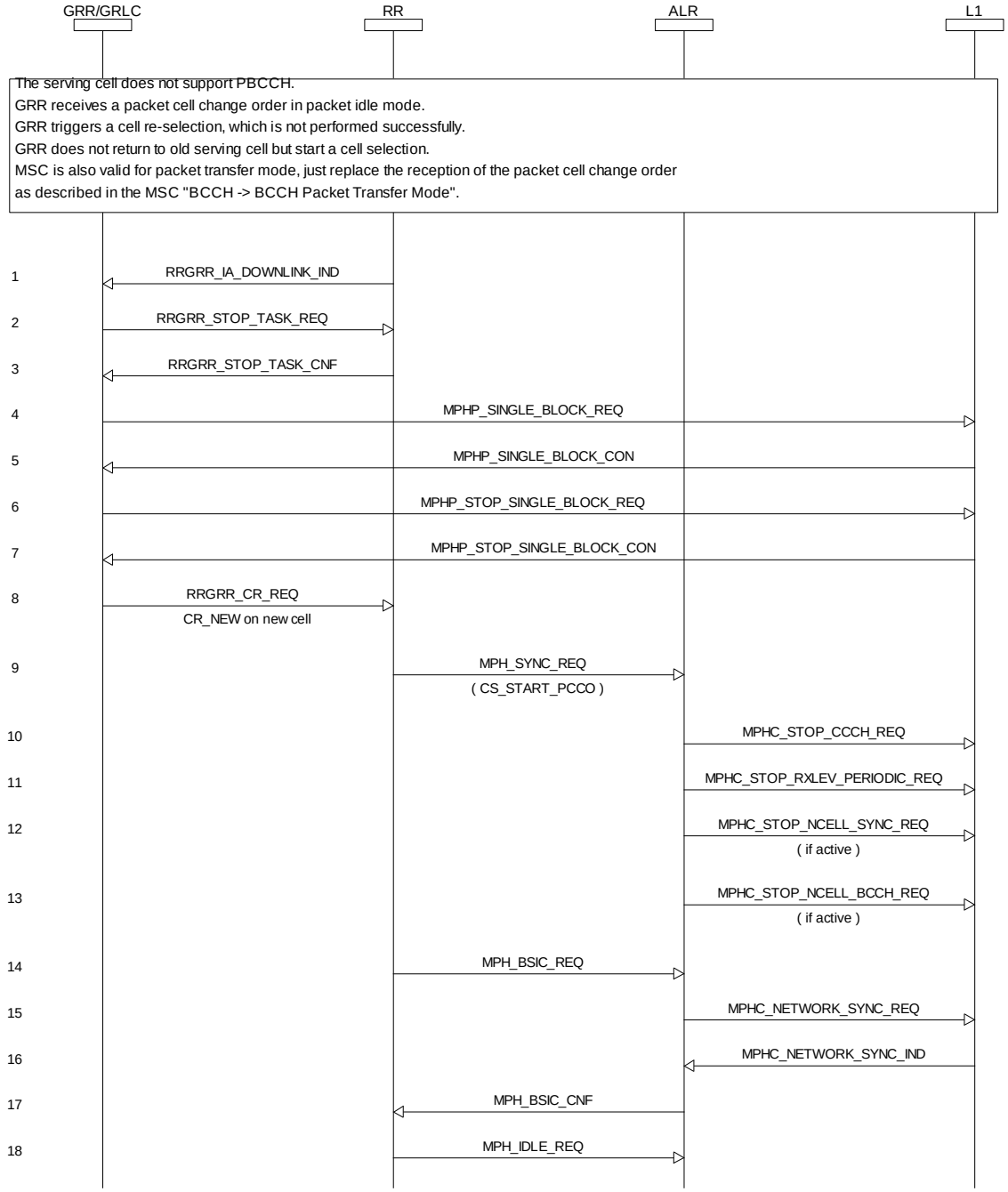


Figure 60 PCCO received in SCELL without PBCCH / Failure / Cell Selection Started

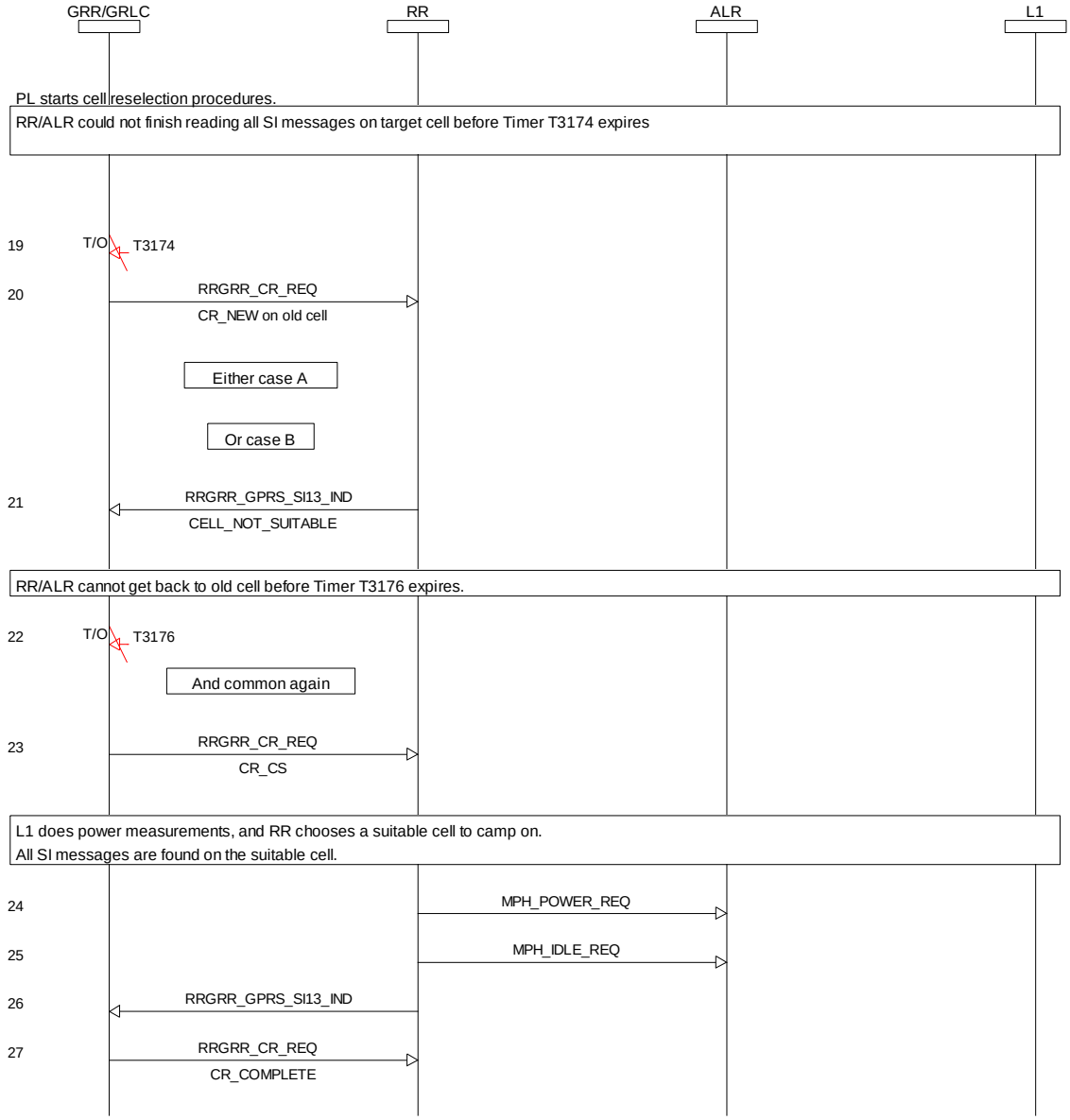


Figure 61 PCCO received in SCELL without PBCCH / Failure / Cell Selection Started – Continued

2.11 State Transitions on PBCCH

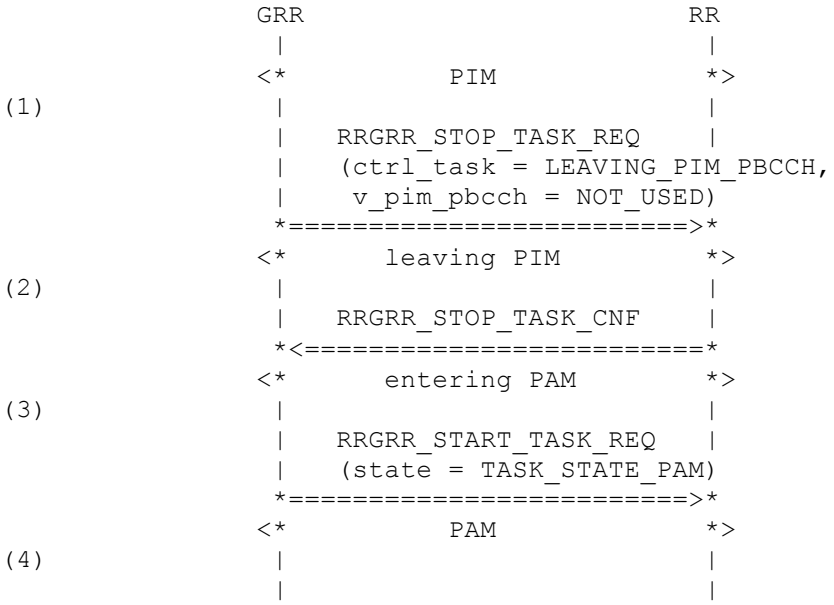
State Transition Synchronisation between RR-GRR:

On a transition of state in GRR, RR has to be informed with a RRGRR_STOP_TASK_REQ. This allows RR to stop all running procedures of the old state. After stopping them RR informs GRR with a RRGRR_STOP_TASK_CNF. Then GRR can transition to the new state and inform RR of the new state with a RRGRR_START_TASK_REQ which allows RR to start the procedures necessary in the new state (if available). This only applies to the transitions between packet idle, packet access and packet transfer mode. The time at which GRR has to stop all running procedures of the old state is not specified. It could be either:

- before sending the RRGRR_STOP_TASK_REQ or
- after receiving the RRGRR_STOP_TASK_CNF and before starting the procedure of the new state

2.11.1 Packet idle to packet access mode

Description: Specifies the state transition handling.



1) GRR is leaving packet idle mode and wants to establish a TBF. GRR orders RR to stop all activities which RR is doing in packet idle mode.

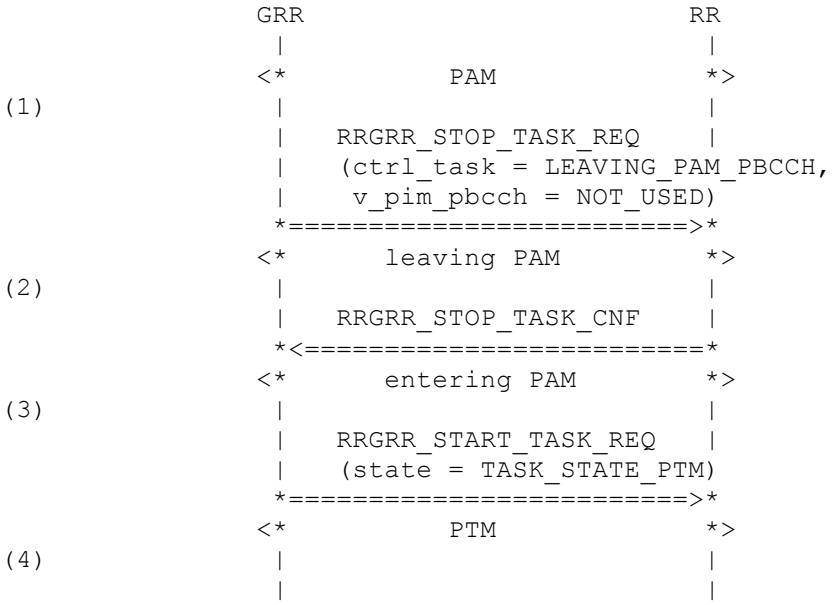
2) RR stops all active tasks: CCCH reading (NMO III) and any active ncell procedures.

3) GRR will start all activities related to packet access mode and after doing this informs RR of the completed state transition.

4) RR will start all activities suitable for this state (in this case nothing).

2.11.2 Packet access to packet transfer mode

Description: Specifies the state transition handling.



1) GRR is leaving packet access mode. GRR orders RR to stop all activities which RR is doing in packet access mode.

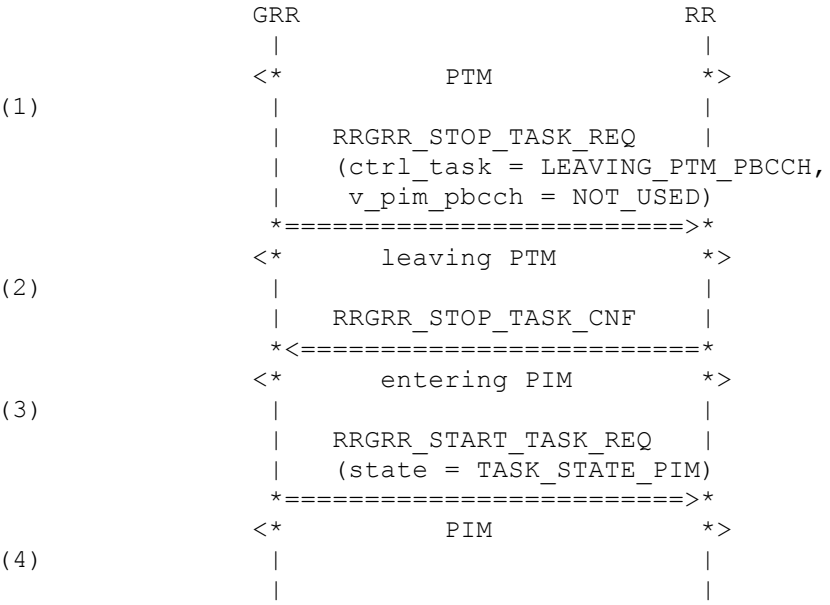
2) RR stops all active tasks.

3) GRR will start all activities related to packet transfer mode and after doing this informs RR of the completed state transition.

4) RR will start all activities suitable for this state: CCCH reading (NMO III).

2.11.3 Packet transfer to packet idle mode

Description: Specifies the state transition handling.



1) GRR is leaving packet transfer mode. GRR orders RR to stop all activities which RR is doing in packet transfer mode..

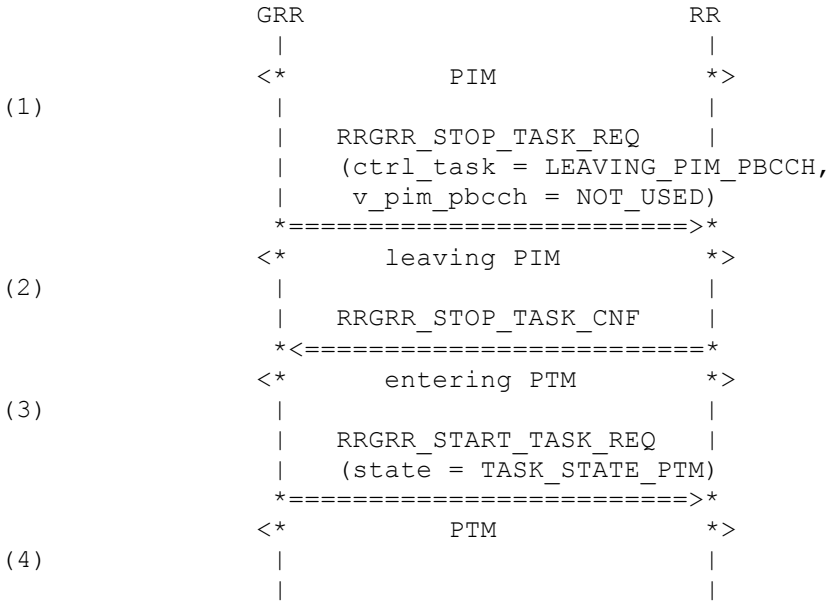
2) RR stops all active tasks: CCCH reading, active ncell procedures.

3) GRR will start all activities related to packet idle mode and after doing this informs RR of the completed state transition.

4) RR will start all activities suitable for this state: CCCH reading (NMO III), parallel HPLMN search.

2.11.4 Packet idle to packet transfer mode

Description: Specifies the state transition handling.



1) GRR is leaving packet idle mode. GRR orders RR to stop all activities which RR is doing in packet idle mode..

2) RR stops all active tasks: CCCH reading, parallel active ncell procedures, HPLMN search.

3) GRR will start all activities related to packet transfer mode and after doing this informs RR of the completed state transition.

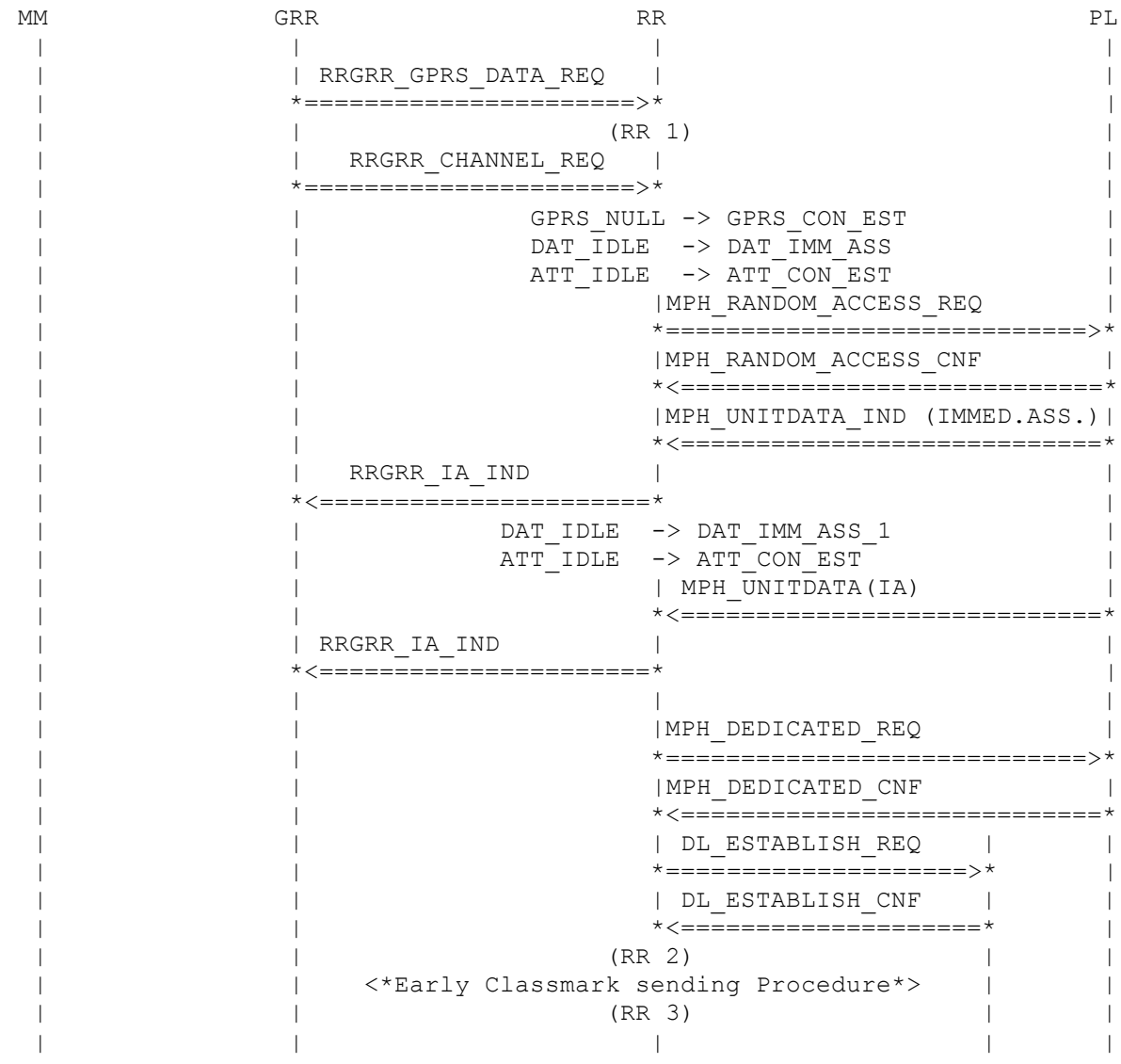
4) RR will start all activities suitable for this state: CCCH reading (NMO III).

2.12 Dedicated Mode Procedures related to GPRS (obsolete)

2.12.1 Initialisation Request / class B

Description:

This MSC describes the last part of the <Packet Access using CCCH procedure> when the SABM is send on the SDCCH.



(RR 1)
GRR gives RR all necassary information to build an RR INITIALISATION REQUEST message if an IA is specifing a SDCCH assignment.

(RR 2)
After receiving the DL_ESTABLISH_CNF RR has successfully established a connection over the SDCCH to the BS.

The SABM contains the RR INITIALISATION REQUEST.

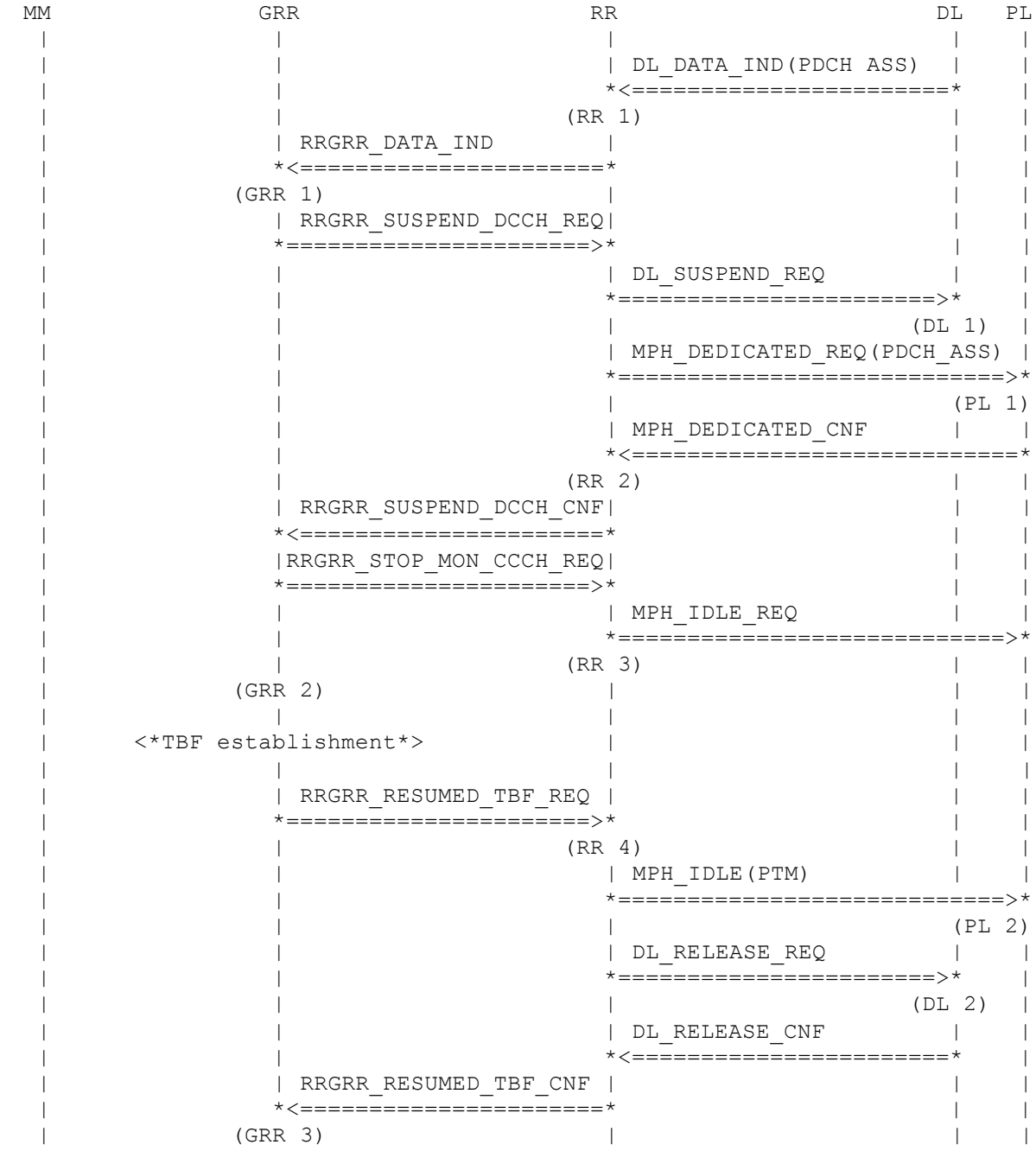
(RR 3)
After connection establishment RR has to send a CLASSMARK CHANGE immediately.

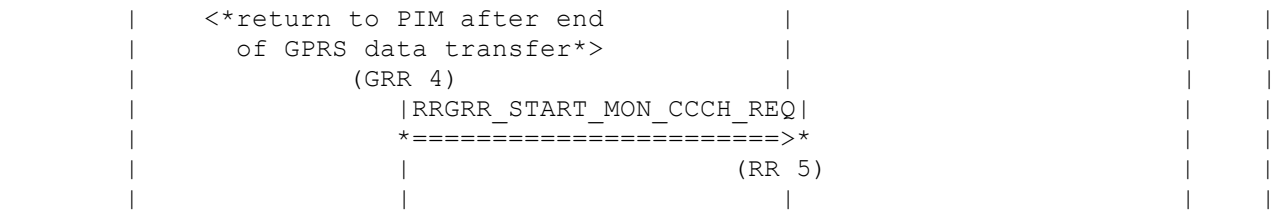
2.12.2 PDCH Assignment/ success

Description:

After the RR Initialisation request has been send the MS waits for a RR command from the network.
This can be an assignment to a packet data channel. The procedure for an assignment command
is as following:

- Suspension of normal operation except RR messages
- Release of the main signalling link
- Deactivation of previous assigned channel(L1)
- Activation of new channel(L1)
- TBF establishment on new link





(RR 1)

RR receives a PDCH ASSIGNMENT COMMAND. This is indicated to GRR. RR waits for a request from GRR to stop the signalling link. The GPRS process of RR is in state GPRS_AVAIL or GPRS_PIM_BCCH.

(GRR 1)
GRR checks if it is a valid message and stops the DCCH link.

(DL 1)
DL is suspended. DL enters state STATE_IDLE_DL.

(PL 1)
The current channel configuration is saved and the L1 channel configuration is stopped. L1 is also set to Page Mode Reorganization (by MPHC_START_CCCH_REQ) in order to receive a potential new channel assignment before the expiry of the TBF starting time for the current PDCH Assignment. - RR enters state DAT_PDCH_ASS.

(RR 2)
RR receives the confirmation about the channel stop at L1. RR notifies GRR about the stop of the channels at L1. RR enters state DAT_PDCH_ASS_1

(RR 3)
On receipt of RRGRR_STOP_MON_CCCH_REQ RR enters state GPRS_PTM.

(GRR 2)
After GRR has done a successful contention resolution and TBF establishment on the PDCH RR is informed about this by the RRGRR_RESUMED_TBF_REQ.

(RR 4)
RR discards the old channel configuration and enters state GPRS_PTM / DAT_PDCH_ASS_2.

(PL 2)
PL discards the old channel configuration and enters state MA_PTM/NC_IDLE.

(DL 2)
DL releases the suspended connection. As DL is in state STATE_IDLE_DL the release is a Local End Release, no Air Interface message (DISC/UA) is sent.

(GRR 3)
GRR is notified of the successful end of the channel release. Note: MM is not notified since a circuit switched connection has not been signalled to MM.

(GRR 4)
GRR selects the new cell after the release of the TBF.

(RR 5)
RR enters state ATT_IDLE, DAT_NULL, GPRS_PIM_BCCH. RR performs Cell Reselection.

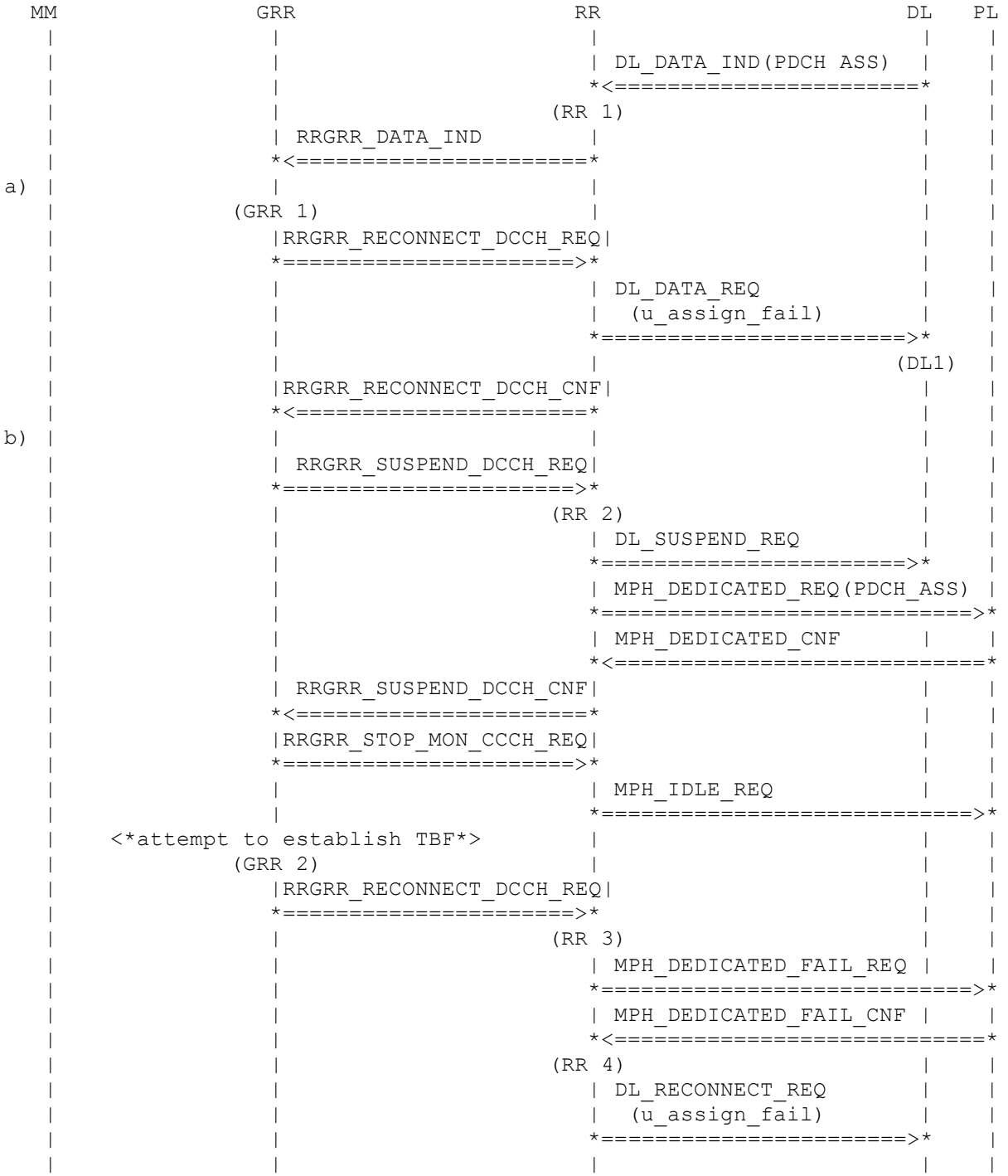
2.12.3 PDCH Assignment/ failure / Start Reconnection

Description:

The PDCH Assignment Procedure may fail with the following causes:

- no cell allocation available
- channel mode unacceptable
- frequency not implemented
- protocol error unspecified (expiry of timer T3190)
- lower layer failure

In all cases except Lower Layer Failure the message ASSIGNMENT FAILURE is sent and GRR is notified about the successful Reconnection to the old channel.



(RR 1)
RR receives the message PDCH ASSIGNMENT COMMAND. This message is forwarded to GRR.

(GRR 1)
GRR checks the message. If the message is invalid then the ASSIGNMENT cannot be performed. An ASSIGNMENT FAILURE message (u_assign_fail) has to be send to the network.

(DL 1)
DL sends message ASSIGNMENT FAILURE to the network. RR and DL remain in dedicated mode on the old channel (no Layer 2 Suspension).

(RR 2)
The the message contents of PDCH ASSIGNMENT COMMAND is correct. GRR requests RR to suspend the connection. This request is forwarded to both DL and PL.

(GRR 2)
GRR attempts to entsablish a TBF.

(RR 3)
However the attempt fails. RR is informed about this by the RRGRR_RESUME_DCCH_REQ with a specified cause. RR enters state PDCH_ASS_3.

(RR 4)
PL notifies RR about the successful reconnection to the old channel at PL. RR requests DL to reconnect to the old channel and to send the message ASSIGNMENT FAILURE. RR enters state PDCH_ASS_4.

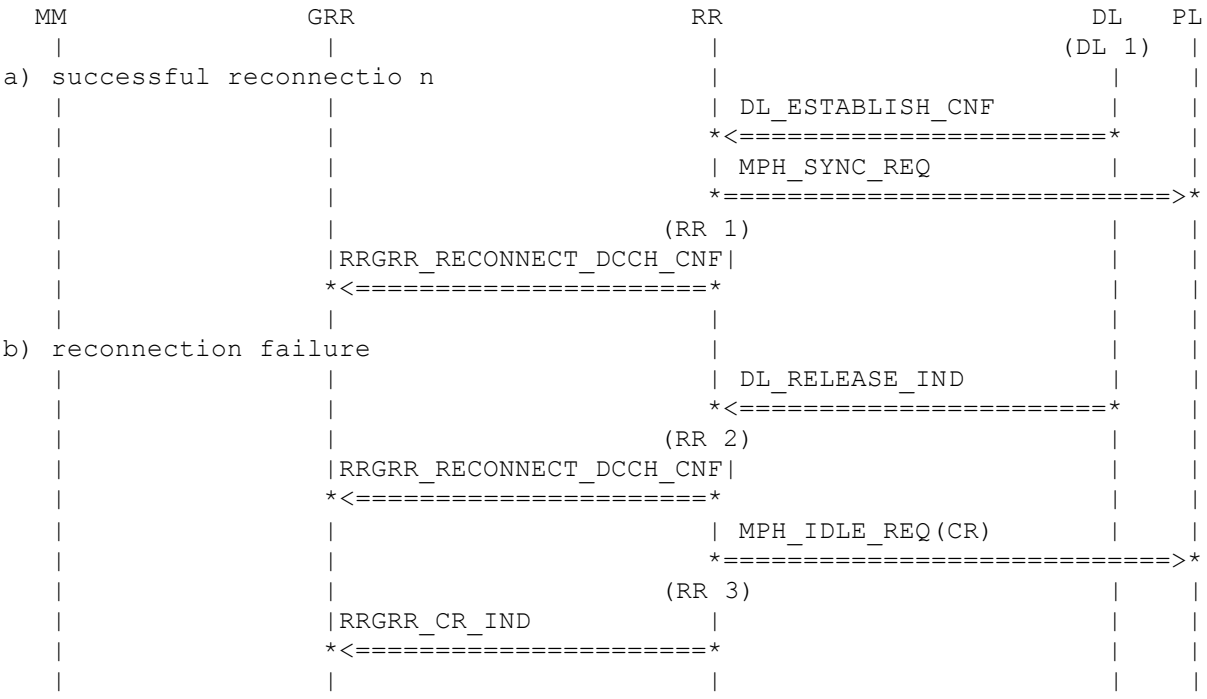
2.12.4 PDCH Assignment Command/ Reconnection completion

Description:

After a failure during a PDCH Assignment procedure the reconnection to the old channel is

- successful (and the message ASSIGNMENT FAILURE is sent) or
- fails with a Lower Layer Failure.

In both cases GRR is notified.



(DL 1)
DL has received DL_RECONNECT_REQ(u_assign_fail). RR is in state PDCH_ASS_4.

(RR 1)

The Reconnection of the old channel at DL is successful. RR forwards this result to GRR.

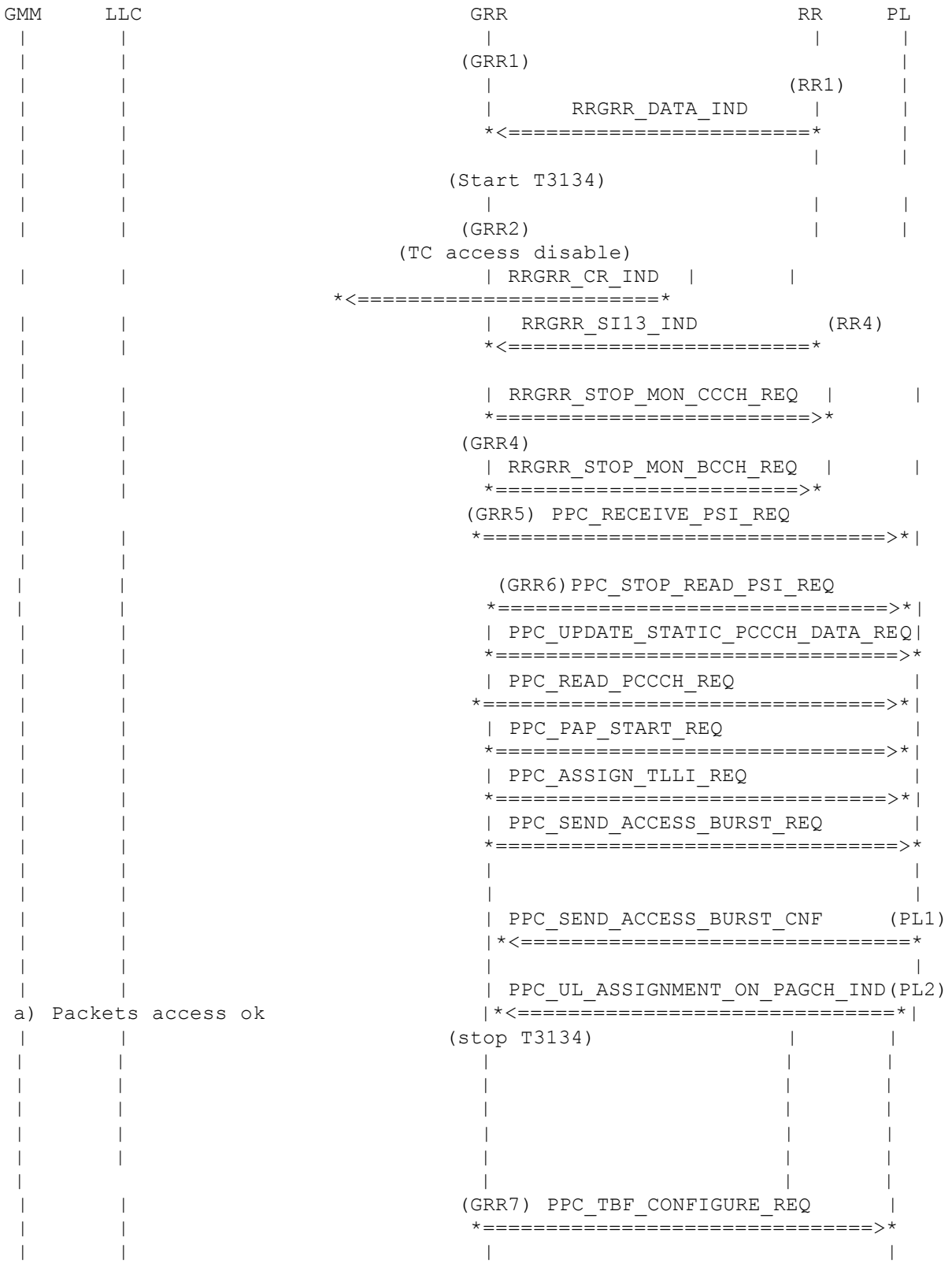
(RR 2)

The Reconnection of the old channel at DL is not successful. RR forwards this result to GRR.

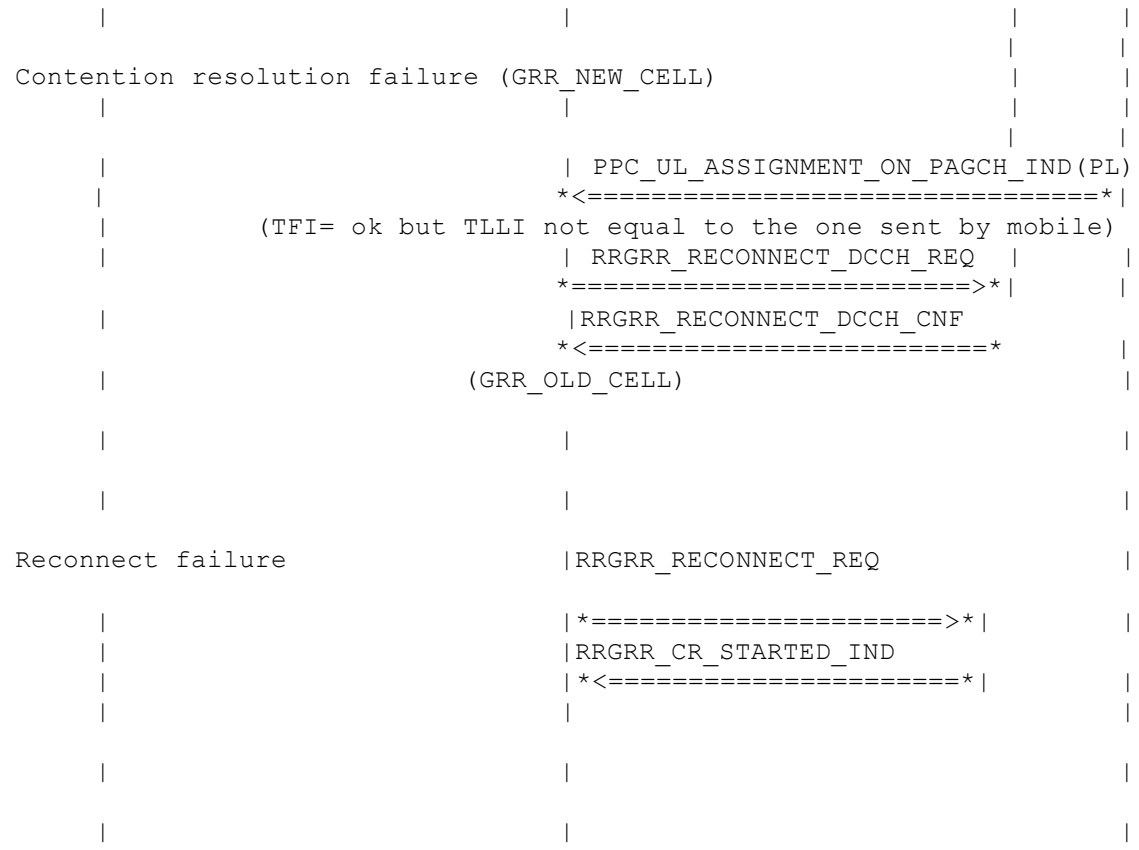
(RR 3)
RR configures the lower layer to Idle Mode.

2.12.5 Measurement Order

2.12.6 Measurement Order/ reading PBCCH




PPC_TBF_CONFIGURE_CNF
(GRR8) RRGRR_RESUMED_TBF_REQ
GRR_READY (GRR9)
(GRR9)
PPC_ACCESS_REJECT_ON_PCCCH_IND(PL3)
b) Packet access reject
(GRR_NEW_CELL)
RRGRR_RECONNECT_DCCH_REQ
RRGRR_RECONNECT_DCCH_CNF
(GRR_OLD_CELL)
c) Frequency not implemented
(RR_OLD_CELL)
(GRR_OLD_CELL)
d) Timer T3134 out
(NEW_CELL)
(T3134 expired)
PPC_UL_ASSIGNMENT_ON_PAGCH_IND(PL)
RRGRR_RECONNECT_DCCH_REQ
RRGRR_RECONNECT_DCCH_CNF
(GRR_OLD_CELL)



(GRR1) GRR receives from RR Indication that control primitive is there. This primitive has two parameters where the second is the second is RR_Network_Cell_Change_Order primitive in wish we have the identification of the new cell that will be selected.
(GRR2) On receipt of this primitive GRR suspend his link with upper layer LLC through PPC entities by sending TBF CTR to disable TBF access.
(GRR3) GRR starts now listen to the CCCH (serving cell) in order to receive system information or packet system information (PSI, SI) here BCCH or PBCCH could be received by mobile station.

(RR3) RR sends cell reselection trigger to GRR during it was listened to the channel.

(RR4) RR at the same was following time RR sent SI13 system information to GRR.

(GRR4) GRR has received PBCCH and stop listening to CCCH and BCCH.

(GRR5) GRR request from the PL the reading of PBCCH.
(GRR6) GRR starts the building of TBF by successfully:

- updating parameters its has readied,
- requesting the PL to read the parameters it has described,
- requesting the PL to get ready for packet access procedure,
- sending TLLI request (addressing to use resources for GPRS),
- sending packet access request.

(PL1) GRR received the packet access procedure confirmation.

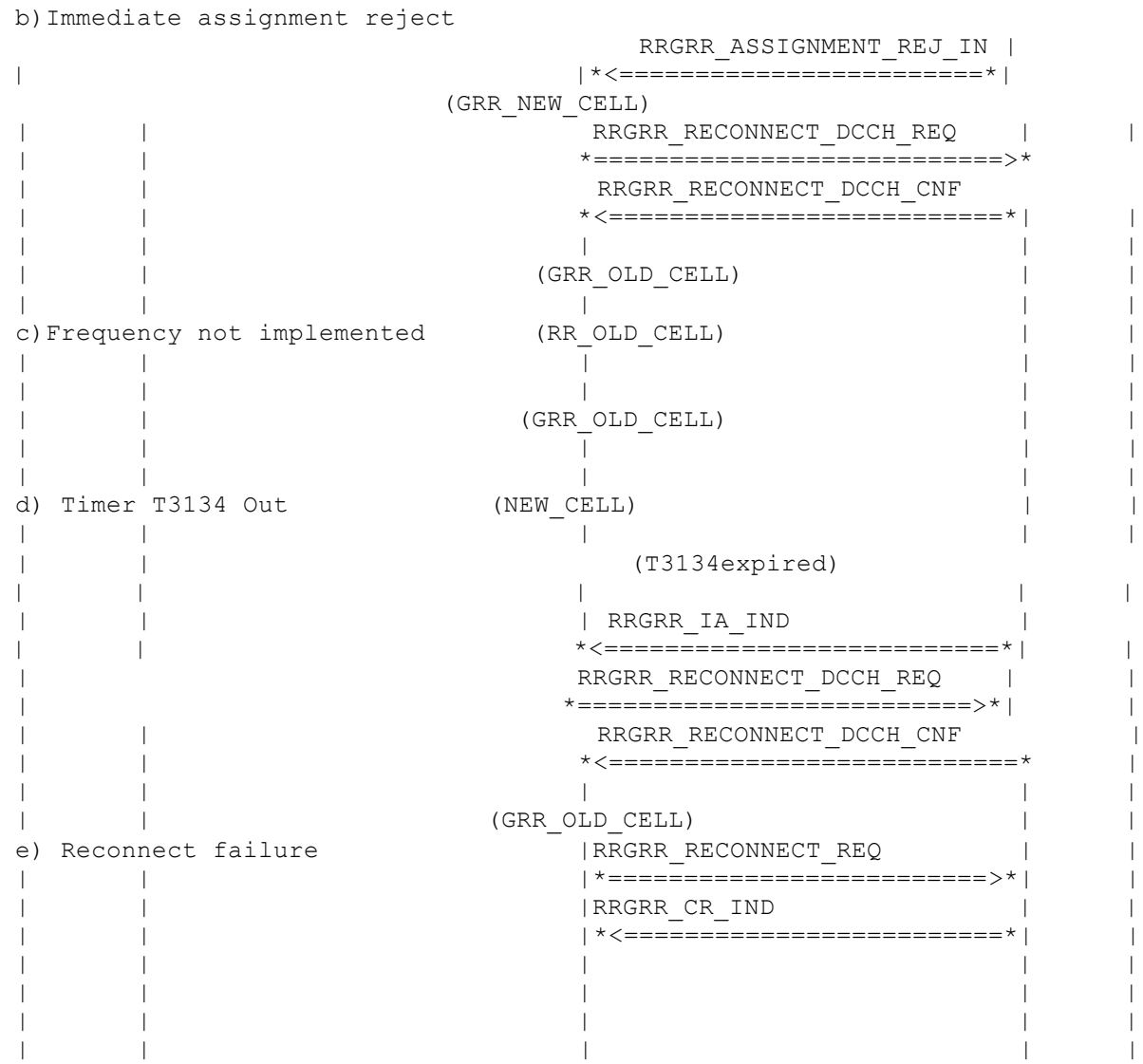
(PL2) PL sends packet uplink assignment.

(GRR8) When completed building TBF GRR sends Trigger to RR to confirm that the procedure is complete.

(GRR9) GRR´s upper layer can send packet to GRR now.
b) In case the PL cannot set up the cell reselection parameters sending by the network it will reject the packet access procedure and GRR have to resume the old cell.
c) Case the frequency indicated in the Cell Change Order cannot be handled by the Mobile Station RR will handle this exception and any change should not be done.

d) In case T3134 timer out before packet ul assignment came GRR will send reconnection request in order to resume the old cell.
e) In case GRR received the ul assignment ok but resolution failure GRR will send reconnection request in order to resume the old cell.
f) In case the reconnection failure has occurred RR will select new cell.

2.12.7 Measurement Order/ reading BCCH



(GRR1) GRR receives from RR Indication that control primitive is there. This primitive has two parameters where the second is the second is RR_Network_Cell_Change_Order primitive in which we have the identification of the new cell that will be selected.
(GRR2) On receipt of this primitive GRR suspend his link with upper layer LLC through PPC entities by sending TBF CTR to disable TBF access.
(GRR) GRR starts now listen to the CCCH (serving cell) in order to receive system information or packet system information (PSI, SI) here BCCH or PBCCH could be received by mobile station.

(RR3) RR sends cell reselection trigger to GRR during it was listened to the channel.

(RR4) RR at the same was following time RR sent SI13 system information to GRR.

(GRR3) GRR request from the PL the reading of BCCH.
(GRR4) GRR makes channel request to RR.
(RR5) RR sends immediate assignment to GRR.

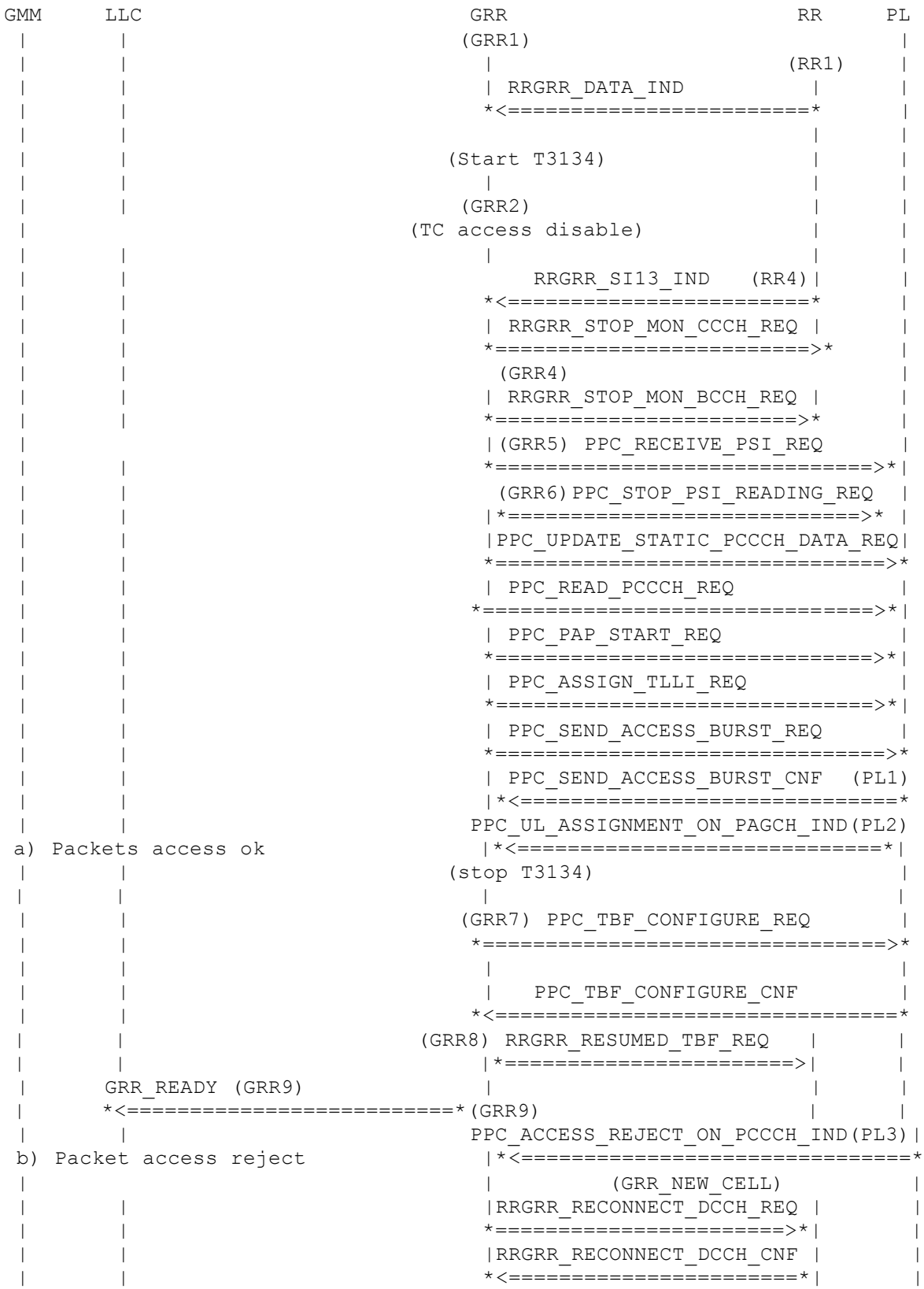
(GRR6) TBF building this is completed when GRR received from PL PPC_TBF_CONFIGURE_CNF.

(GRR7) GRR sends Trigger to RR to confirm that the procedure is complete.

(GRR8) When completed building TBF GRR sends Trigger to upper layer LLC in order to re-establish the link.
b) In case the RR cannot set up the cell reselection parameters sending by the network it will reject the channel request and GRR have to resume the old cell.
c) Case the frequency indicated in the Cell Change Order cannot be handled by the Mobile Station RR will handle this exception and any change should not be done.
d) In case T3134 timer out before packet immediate assignment came GRR will send reconnection request in order to resume the old cell.
e) In case GRR received the ul assignment ok but resolution failure GRR will send reconnection request in order to resume the old cell.
f) In case the reconnection failure has occurred RR will select new cell.

2.12.8 RR Network Command Cell Change Order

2.12.8.1 Case Reading PBCCH



(GRR1) GRR receives from RR Indication that control primitive is there. This primitive has two parameters where the second is the second is RR_Network_Cell_Change_Order primitive in wish we have the identification of the new cell that will be selected.
(GRR2) On receipt of this primitive GRR suspend his link with upper layer LLC through PPC entities by sending TBF CTR to disable TBF access.
(GRR3) GRR starts now listen to the CCCH (serving cell) in order to receive system information or packet system information (PSI, SI) here BCCH or PBCCH could be received by mobile station.

(RR4) RR at the same was following time RR sent SI13 system information to GRR.

(GRR4) GRR has received PBCCH and stop listening to CCCH and BCCH.

(GRR5) GRR request from the PL the reading of PBCCH.
(GRR6) GRR starts the building of TBF by successfully:

- updating parameters its has readied,
- requesting the PL to read the parameters it has described,
- requesting the PL to get ready for packet access procedure,
- sending TLLI request (addressing to use resources for GPRS),
- sending packet access request.

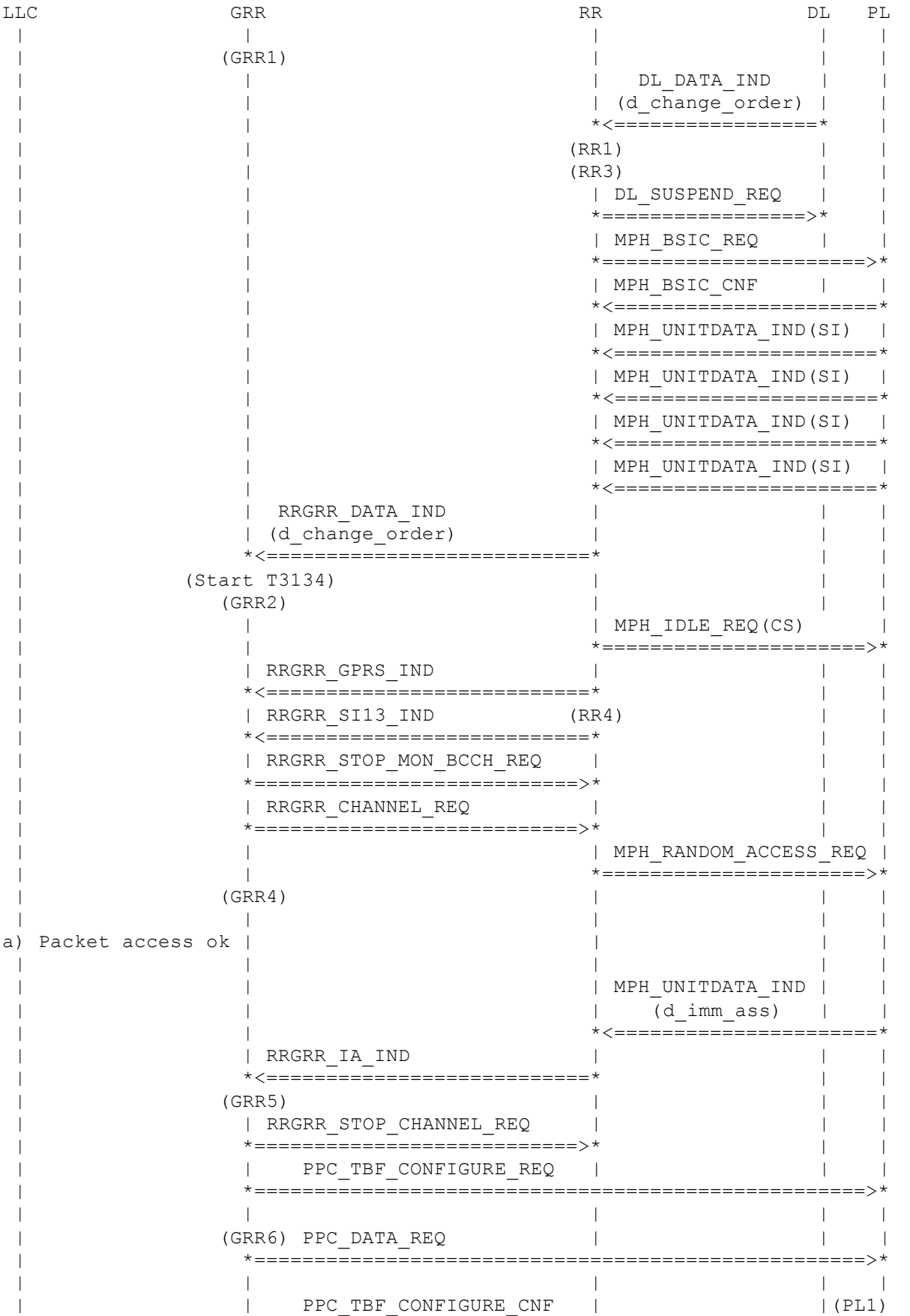
(PL1) GRR received the packet access procedure confirmation.

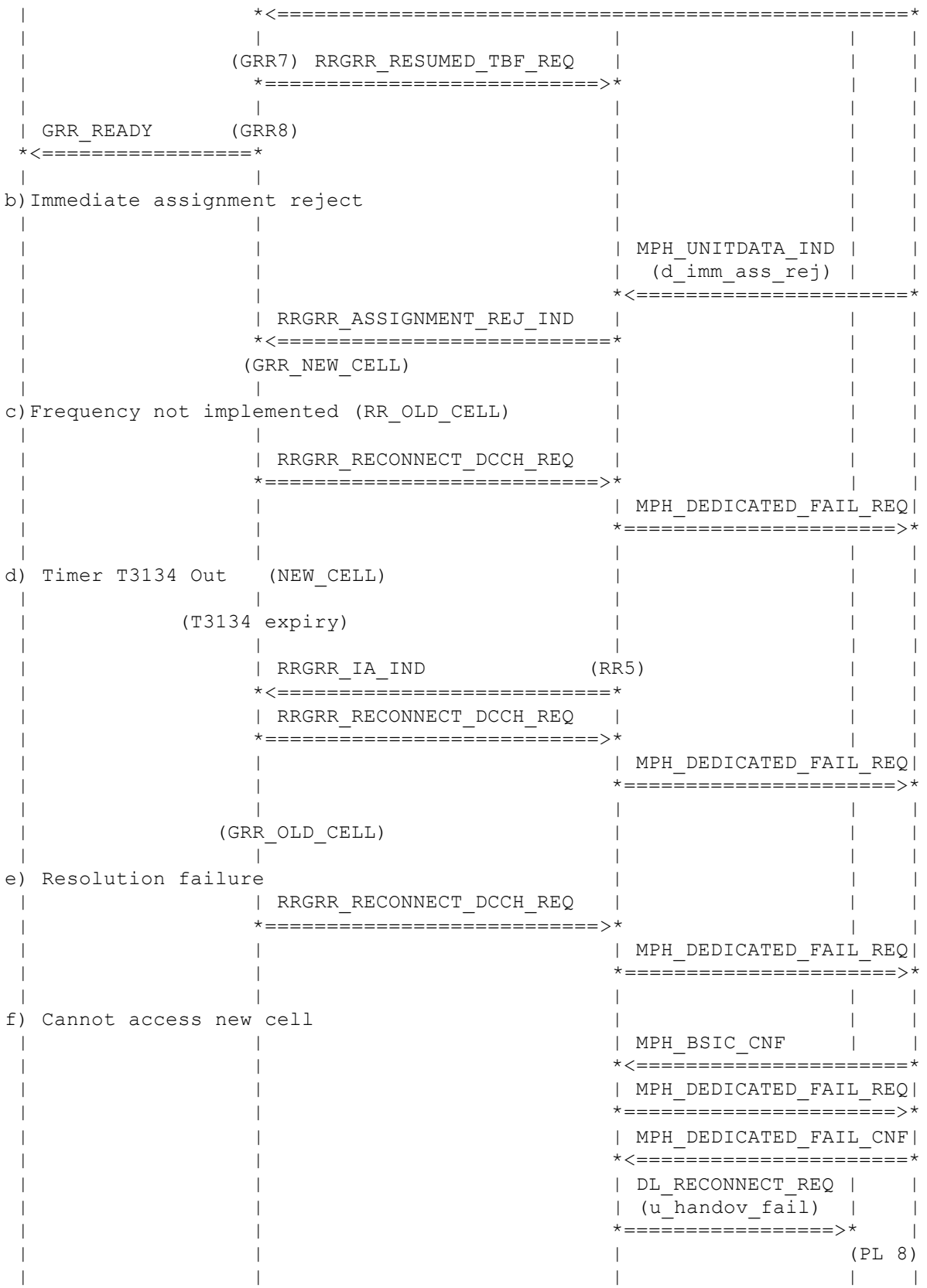
(PL2) PL sends packet uplink assignment.

(GRR8) When completed building TBF GRR sends Trigger to RR to confirm that the procedure is complete.

(GRR9) GRR´s upper layer can send packet to GRR now.
b) In case the PL cannot set up the cell reselection parameters sending by the network it will reject the packet access procedure and GRR have to resume the old cell.
c) Case the frequency indicated in the Cell Change Order cannot be handled by the Mobile Station RR will handle this exception and any change should not be done.
d) In case T3134 timer out before packet ul assignment came GRR will send reconnection request in order to resume the old cell.
e) In case GRR received the ul assignment ok but resolution failure GRR will send reconnection request in order to resume the old cell.
f) In case the reconnection failure has occurred RR will select new cell.

2.12.8.2 Case reading BCCH




(GRR7) RRGRR_RESUMED_TBF_REQ
GRR_READY
(GRR8)
b) Immediate assignment reject
MPH_UNITDATA_IND
(d_imm_ass_rej)
RRGRR_ASSIGNMENT_REJ_IND
(GRR_NEW_CELL)
c) Frequency not implemented (RR_OLD_CELL)
RRGRR_RECONNECT_DCCH_REQ
MPH_DEDICATED_FAIL_REQ
d) Timer T3134 Out
(NEW_CELL)
(T3134 expiry)
RRGRR_IA_IND
(RR5)
RRGRR_RECONNECT_DCCH_REQ
MPH_DEDICATED_FAIL_REQ
(GRR_OLD_CELL)
e) Resolution failure
RRGRR_RECONNECT_DCCH_REQ
MPH_DEDICATED_FAIL_REQ
f) Cannot access new cell
MPH_BSIC_CNF
MPH_DEDICATED_FAIL_REQ
MPH_DEDICATED_FAIL_CNF
DL_RECONNECT_REQ
(u_handov_fail)
(PL 8)

(GRR 1)
GRR receives a control primitive from RR. This primitive has two parameters, the second parameter is a RR_Network_Cell_Change_Order message (d_change_order) which contains the identification of the new cell that will be selected.

(RR 1)
RR also analysis the message d_change_order and initiates a Cell Reselection.

(GRR 2)
On receipt of this primitive GRR suspends its link with upper layer LLC through PPC entities by sending TBF CTR to disable TBF access.

(RR 3)
RR performs a Local End Release, the current configuration of the Dedicated Mode is saved in case of Reconnection. RR starts listening to the new CCCH in order to receive System Information. The Request MPH_BSIC_REQ may and unsuccessful with MPH_ERROR_IND, this scenario is not shown here.

(RR 4)
SI13 indicates that no PBCCH is present in the new cell.

(GRR 4)
GRR starts the establishment of the TBF. GRR performs Channel Request via RR.

(RR 5)
RR sends immediate assignment to GRR.

(GRR 6)
TBF building this is completed when GRR received from PL PPC_TBF_CONFIGURE_CNF.

(GRR 7)
GRR sends Trigger to RR to confirm that the procedure is complete.

(GRR 8)
When completed building TBF GRR sends Trigger to upper layer LLC in order to re-establish the link.

b)
In case the RR cannot set up the cell reselection parameters sending by the network it will reject the channel request and GRR have to resume the old cell.

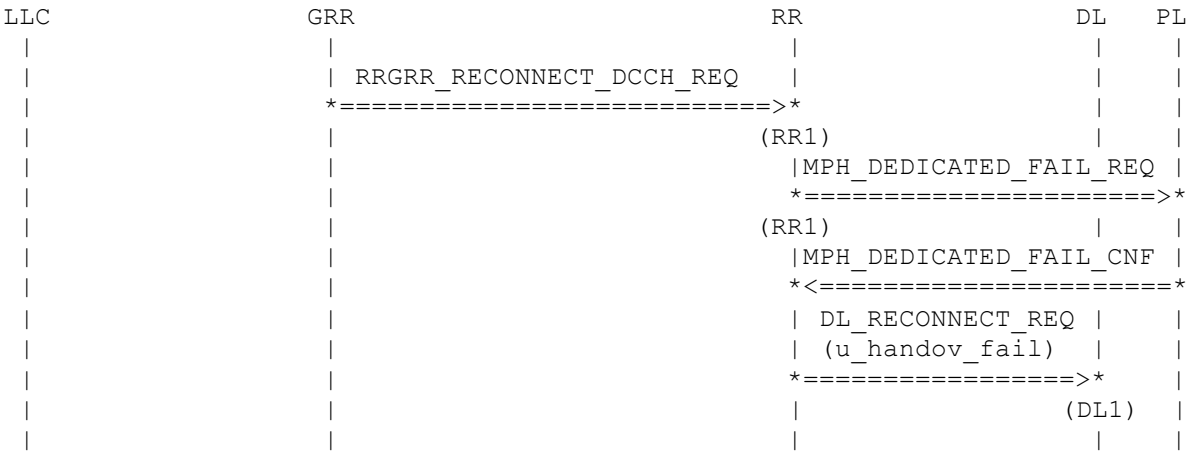
c)
Case the frequency indicated in the Cell Change Order cannot be handled by the Mobile Station RR will handle this exception and any change should not be done.

d)
In case T3134 timer out before packet immediate assignment came GRR will send reconnection request in order to resume the old cell.

e)
In case GRR received the ul assignment ok but resolution failure GRR will send reconnection request in order to resume the old cell.

f)
Layer 1 cannot access the specifies cell. A negative response to MPH_BSIC_REQ is received (MPH_BSIC_CNF). The Reconnection is started. The second part of Reconnection is described ina subsequent section.

2.12.8.3 Case reading BCCH, Start Reconnection

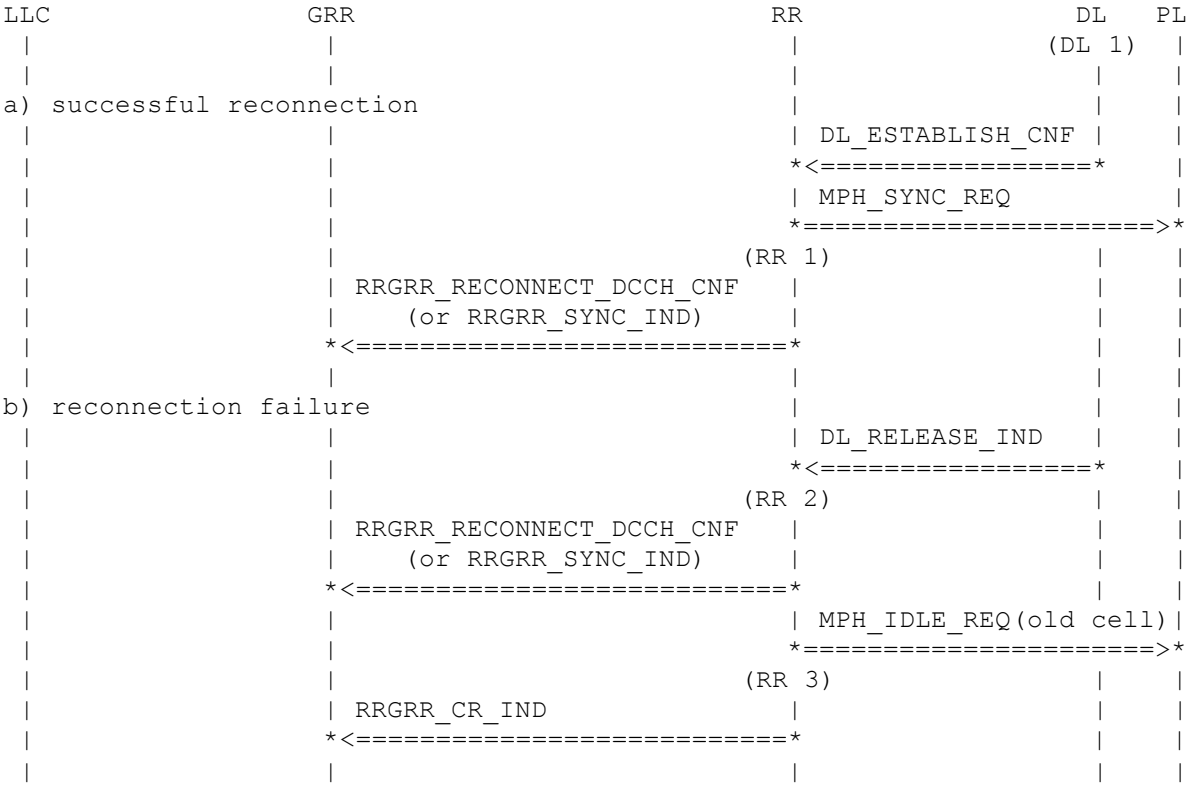


(RR 1)
GRR requests RR to reconnect to the old channel.

(RR 2)
RR prepares PL for reconnection. PL enters dedicated mode.

(DL 1)
RR requests to send the message HANDOVER FAILURE to the network.

2.12.8.4 Case reading BCCH, Reconnection Completion



(DL 1)
DL has received DL_RECONNECT_REQ(u_handov_fail).

(RR 1)
The Reconnection to the old channel at DL is successful. RR forwards this result to GRR. The Primitive RRGRR_RECONNECT_DCCH_CNF is sent when the re-connection was initiated by GRR. Otherwise the re-connection was initiated by RR during MPH_BSIC_REQ/CNF and in this case GRR is notified about the Re-connection with RRGRR_SYNC_IND. The indication RRGRR_SYNC_IND is a signal to GRR not to perform a TBF Establishment.

(RR 2)
The Reconnection to the old channel at DL is not successful. RR forwards this result to GRR.

(RR 3)
RR configures the lower layer to Idle Mode.

2.13 Open Issues misc for PBCCH

High Prio Issue List:

1. Ncell interface, implementation, test (optimized ACQUIRE, CONFIRM i/f).
    a. multiband_report parameter
2. Fix suspend/resume problems -> missing cell reselections.
    a. GRR has to start timer after RA failure
    b. GRR handling of not-quite-suspended state
    c. Re-establishment, special cell reselection
3. PLMN selection, parallel search
    a. Handling of GPRS not allowed! (seems similiar to LAI romaing not allowed)
    b. HPLMN search in Packet Idle -> not-quite-suspended

Low Prio Issues (will probably done later):

4. Cell Reselection Optimization when PBCCH is active on target cell
    a. Parameters for ACT_IND for MM how to get them in SYNC_REQ case
    b. Cell Alloc from PSI 2 only for sync case
    c. forbidden lai handling only sync case
5. BCCH information (BA List) in PBCCH case is not stored anymore in FFS and SIM.

2.14 PBCCH Test cases

The following document shortly describes the basic tests, which the MS should pass for NMO III/PBCCH and MS class B.

2.14.1 Cell Reselection in Network Mode III

Cell Reselection between two cells in idle or transfer mode with different configurations.

I. The MS is in STANDBY or READY/PIM or READY/PTM state.
II. The neighbour cell can be in the same or different RA or LA.
III. The neighbour cell can have PBCCH or BCCH.

Force a cell change by first raising the RXLEV of the neighbour cell and then lowering the RXLEV of the serving cell. This should lead to a cell reselection by GRR.

The tests below shall be done with the following cell configurations:

III.1. Both cells have PBCCH
III.2. Serving cell has PBCCH and neighbour cell has BCCH
III.3. Serving cell has BCCH and neighbour cell has PBCCH

2.14.2 Packet Idle Mode

2.14.2.1 MS is in STANDBY state

2.14.2.1.1 Cells are in same routing area
The MS shall do nothing after the cell is changed.

2.14.2.1.2 Cells are in different routing areas
The MS shall do a RAU after the cell change.

2.14.2.1.3 Cells are in different location areas
The MS shall make a LUP and then a RAU after the cell change.

2.14.2.2 MS is in READY state

2.14.2.2.1 Cells are in same routing area
The MS shall do a CU after the cell change.

2.14.2.2.2 Cells are in different routing areas
The MS shall do a RAU after the cell change.

2.14.2.2.3 Cells are in different location areas
The MS shall make a LUP and then a RAU after the cell change.

2.14.3 Packet Transfer Mode

2.14.3.1 Cells are in same routing area
The MS shall do a CU after the cell change.

2.14.3.2 Cells are in different routing areas
The MS shall do a RAU after the cell change.

2.14.3.3 Cells are in different location areas
The MS shall make a LUP and then a RAU after the cell change.

2.14.4 Mobile-Originated and Mobile-Terminated calls

The MS shall establish a connection and send a GPRS SUPSENSION REQUEST. After the call is released
the MS shall either return to the serving cell directly or make a cell reselection. If the MS was in packet transfer mode before the call it shall resume transfer.

2.14.4.1 Without Handover
The MS shall return to the cell directly after the call and shall either make a RAU or nothing depending on the resumption status. (can be configured by tester?).

2.14.4.2 With Handover
The tests below shall be done with the following cell configurations:

1) Both cells have PBCCH

2) Serving cell has PBCCH and neighbour cell has BCCH
3) Serving cell has BCCH and neighbour cell has PBCCH

2.14.4.2.1 Cells with same routing area

The MS shall make a cell reselection after the call and shall do nothing if it was in packet idle or a cell update
if the MS was in transfer mode before the call.

2.14.4.2.2 Cell with different routing area

The MS shall make a cell reselection after the call and shall do a RAU.

2.14.4.2.3 Cells with different location area

The MS shall make a cell reselection after the call and shall do a LUP and then a RAU.

2.14.5 Misc

2.14.5.1 Simulate connection establishment failure

This can be done either by tester (if possible, by no sending an IMMEDIATE ASSIGNMENT) or by the MS
(via CONFIG primitive). The MS shall recover from this and for example resume transfer.

2.14.5.2 Parallel PLMN search in packet idle mode

The MS shall collect a list of PLMNs in idle mode during this a transfer is started.

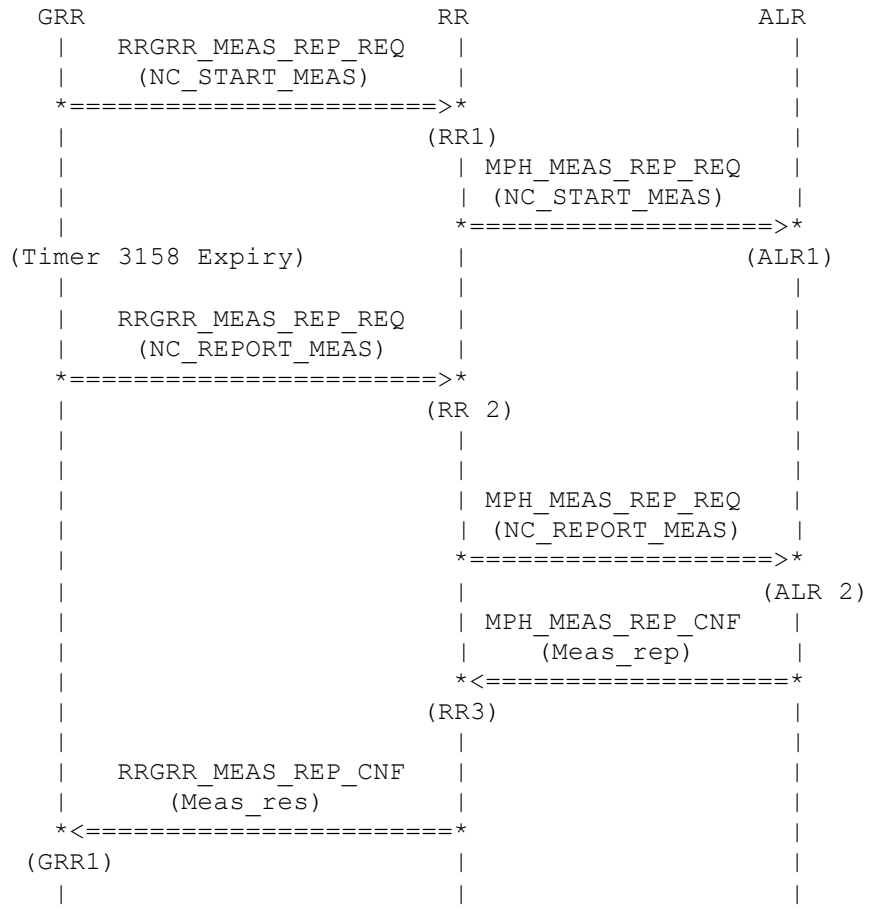
2.14.6 Test order

1. Basic cell reselection in STANDBY mode (both cells with PBCCH/same RA) should be tested.
2. The above test should be done multiple times in a row (e.g. 20 times).
3. Cell reselection in STANDBY mode (both cell with PBCCH/different RA) should be done.
4. MO call in idle without handover should be done.
5. MT call in idle without handover should be done.
6. The above tests (MO/MT) should also be done multiple times in a row.
7. Then repeat the MO/MT calls in idle and do cell reselections in between.
8. Do the rest of the tests.

2.15 NC Measurement report for GPRS

In Network control order, RR will receive Measurement report request from GRR when timer starts.

RR will forward the request to ALR to start storing the measurement values. After the expiry of timer GRR will send the Measurement report request to RR to report the average of measured values. RR sends this to ALR to report the measured values. ALR forwards the average of measured values to RR.RR confirms the measured values to GRR.



(RR 1)
RR is requested by GRR to start the measurement when the timer starts.
(ALR 1)
ALR is requested by RR to start storing the measurement values from PL.
(RR 2)
RR is requested by GRR to report the average of measured values when timer is stopped.
(ALR 2)
ALR is requested to report the average of measured values
(RR 3)
RR is confirmed with average of measured values by ALR.
(GRR 1)
RR confirms GRR with average of measure values.

2.16 State Transition Diagram