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Title	**Comments on MS ranging and network entry in transparent and non-transparent mode**
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Re:	IEEE 802.16j-07/043: "IEEE 802.16 Working Group Working Group Letter Ballot #28"
Abstract	This contribution proposes to correct and merge the paragraphs in MS ranging and network entry in both transparent and non-transparent mode.
Purpose	Text proposal for 802.16j Draft Document.
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Comments on MS ranging and network entry in transparent and non-transparent mode

Kanchei (Ken) Loa, Yi-Hsueh Tsai, Yung-Ting Lee, Hua-Chiang Yin, Shiann-Tsong Sheu, Youn-Tai Lee
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Introduction

In P802.16j/D1, the MS ranging behaviors, which have been defined in 802.16e, are redundantly described in subclauses for MS CDMA initial, periodic and bandwidth-request ranging in both transparent and non-transparent mode. These redundant texts are inconsistent with original text of 802.16e and are potentially troublesome for future maintenance of the standard. Hence, we propose to merge 6.3.9.16.1 and 6.3.9.16.2 into 6.3.10.3.1 "*Contention-based initial ranging and automatic adjustments*", 6.3.10.3.4.1 ~ 6.3.10.3.4.4 into 6.3.10.3.2 "*Periodic ranging and automatic adjustments*", and 6.3.10.3.4.5 into 6.3.10.3.3 "*CDMA HO ranging and automatic adjustment*", respectively, which are consistent with how the MS CDMA ranging and OFDMA-based network entry procedure have been described in IEEE 802.16e-2005 (P802.16REV2-D0d).

Other technical issues that we proposed to resolve in this contribution are following.

1. In the draft document, MR_Code-REP message is used for reporting received CDMA BR ranging code, whereas RNG-REQ message is used for reporting received CDMA initial, handover and periodic ranging codes. By comparing the response latency and message size, using MR_Code-REP message is a better scheme, which also handles reporting multiple CDMA code more efficiently. That is, initial, periodic, BR and handover ranging codes receiving in a frame could be carried by one MR_Code-REP message as multiple codes. Therefore, we propose to replace RNG-REQ message with MR_Code-REP message for all CDMA ranging. After unifying CDMA ranging code report with the MR_Code-REP message, paragraphs and diagrams (sequences charts and flow charts) to handle MS CDMA initial, periodic and bandwidth-request ranging in transparent mode could be combined into one unified scheme.

   The response latency and message size of using RNG-REQ and MR_Code-REP are described in Figure 1 and Table 1, respectively. In the left side of Figure 1, the value of T48 must be at least 5 frames (25 ms for 5-ms frame). The MR-BS should allocate at least 41 bytes for RS sending RNG-REQ message and will send RNG-RSP (or CDMA allocation IE) at the 6th frame after MS sends initial ranging code. Thus, the minimum latency of initial or periodic ranging is 30 ms for 5-ms frame. In the right side of Figure 1, the value of T48 must be at least 3 frames (15 ms for 5-ms frame). MR-BS should allocate at least 26 bytes for RS sending MR-Code-REP message and will send RNG-RSP (or CDMA allocation IE) at the 4th frame after MS sends initial ranging code. Thus, the minimum latency of initial or periodic ranging is 20 ms for 5-ms frame. In summary, response latency and message size for using MR_Code-REP are less than those for using RNG-REQ.

Table 1 Message sizes for RNG-REQ and MR_Code-REP message

Size \ Message		RNG-REQ (bytes)	MR-Code-REP (bytes)
Generic MAC header		6	6
Message body	Fix part	2	2
	Variable part	$14\times Nr$ ~ $29\times Nr$	$14\times Nr$
CRC		4	4
Total		$12+14\times Nr$ ~ $12+29\times Nr$	$12+14\times Nr$

Nr: *Number of CDMA ranging code in a RNG-REQ or an MR_Code-REP message*

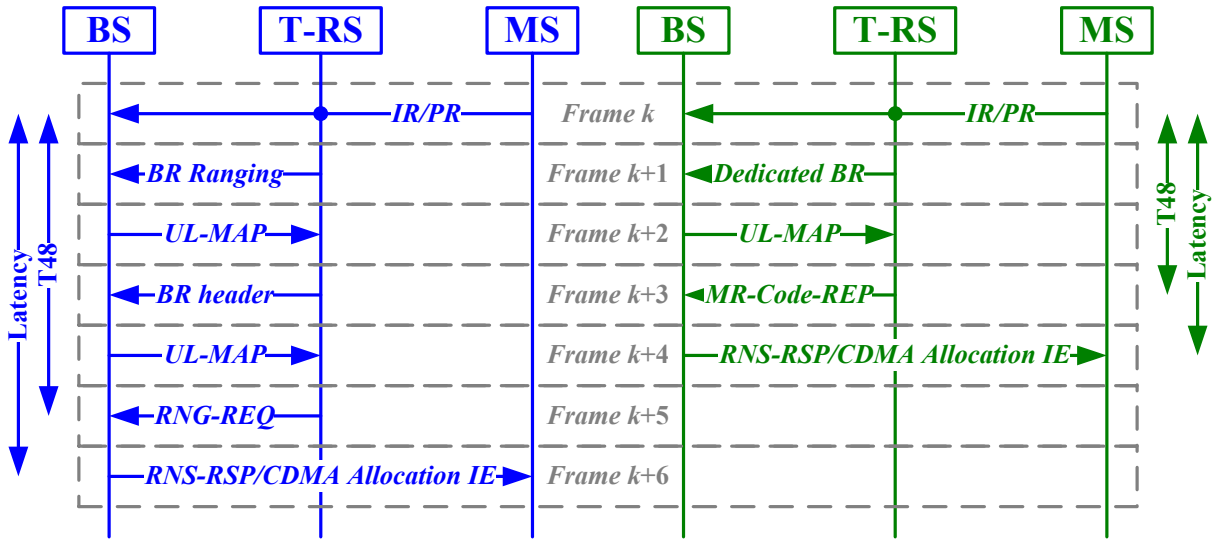


Figure 1 Response latencies for using RNG-REQ and MR_Code-REP

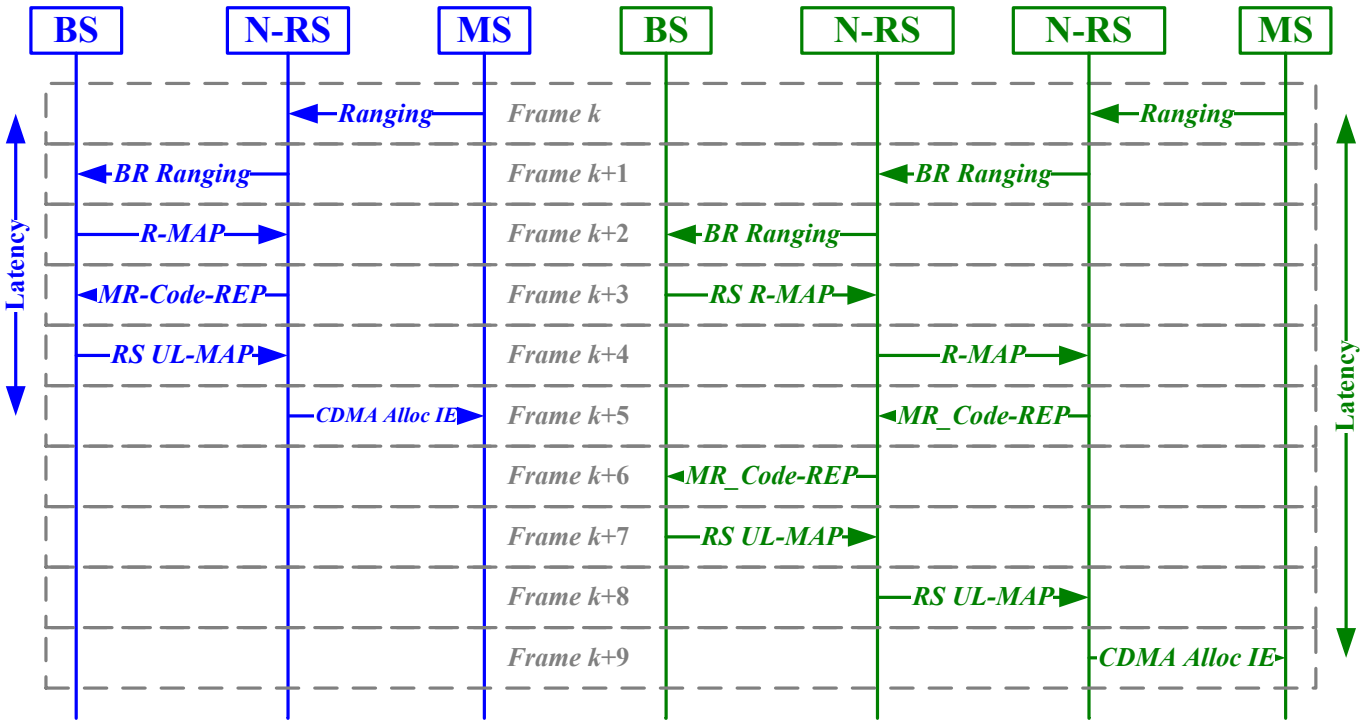
2. In the draft standard, the MR_Code-REP header is used to request MR-BS to allocate BW via CDMA-Allocation_IE for MS sending BR header after RS receiving CDMA BR ranging code, whereas RNG-REQ message is used to request MR-BS to allocate BW via CDMA-Allocation_IE for MS sending RNG-REQ message after RS receiving CDMA initial and handover ranging codes. However, because of the limitation of T3 timer (60 ms for initial or periodic ranging), the current scheme that utilizes RNG-REQ message cannot be used to request CDMA-Allocation_IE for non-transparent RS with hop-count more than two. Therefore, the latency of MS requesting CDMA-Allocation_IE needs to be reduced. In addition, by comparing the response latency and message/header size, using MR_Code-REP header is a better scheme, which also handles reporting multiple CDMA code more efficiently. Hence, we propose to use "MR_Code-REP header" instead of "RNG-REQ message" for requesting CDMA-Allocation_IE for MS.

   The message size and response latency of using MR_Code-REP header and RNG-REQ message are described in Table 2 and Figure 2, respectively. The minimum latencies of 2-hop and 3-hop scenarios using RNG-REQ message are 7 and 13 frames (35 ms and 65 ms for 5-ms frame), respectively. Hence the latency using RNG-REQ message in 3-hop scenario becomes unacceptable since the T3 timer (60 ms for initial or periodic ranging) at MS side has already been expired. The minimum latencies of 2-hop and 3-hop scenarios using MR_Code-REP header are 5 and 9 frames (25 ms and 35 ms for 5-ms frame), respectively. In summary, the response latency and message size for using MR_Code-REP header are less than response latency and message size for using RNG-REQ message. The comparison of response latency of using MR_Code-REP header and RNG-REQ message are described in Table 3.

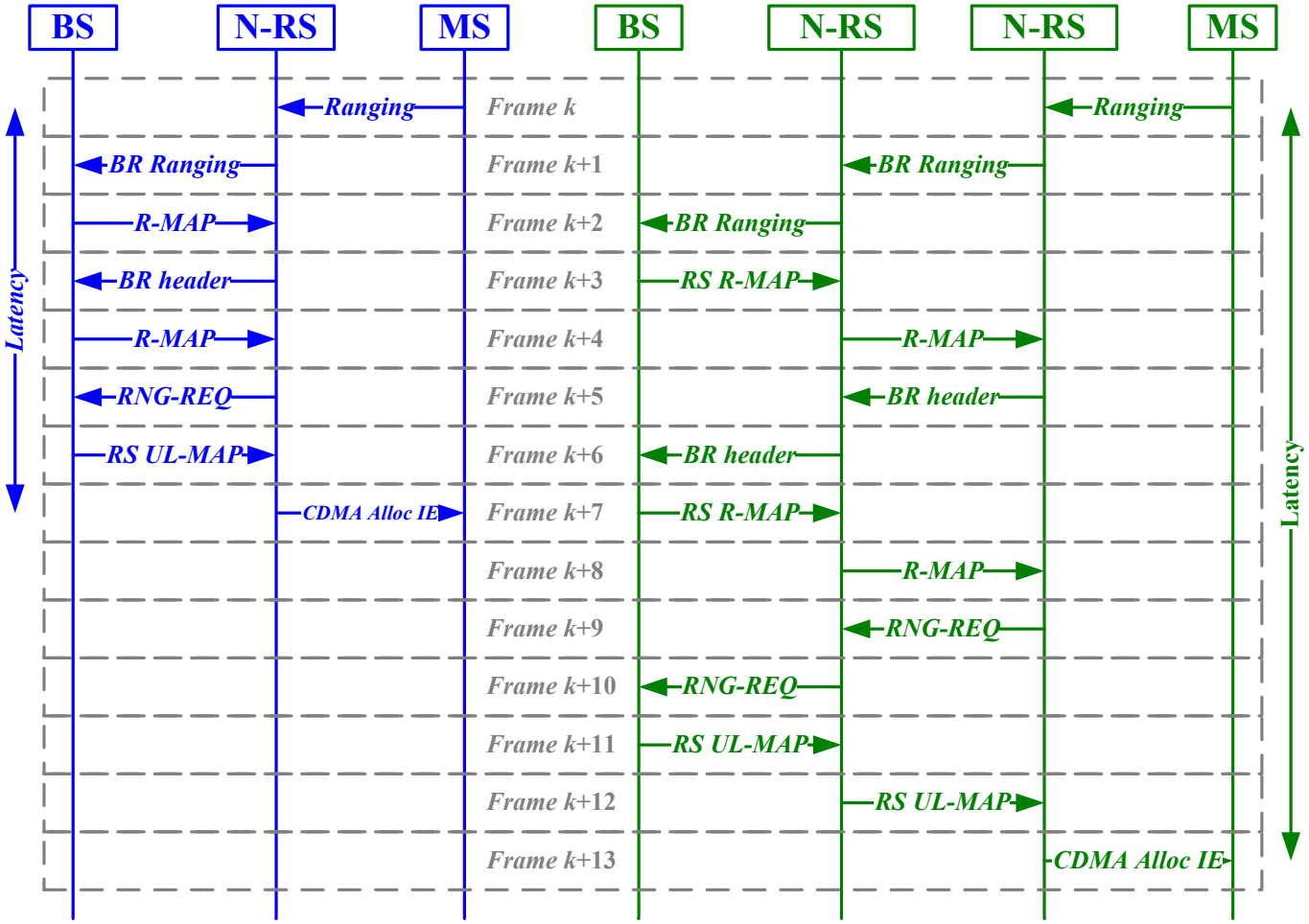
Table 2 Message sizes for RNG-REQ message and MR_Code-REP header

Size \ Message		RNG-REQ (bytes)	MR-Code-REP (bytes)
Generic MAC header		6	6
Message body	Fix part	2	0
	Variable part	14×*Nr*	0
CRC		4	0
Total		12+14×*Nr*	6

Nr: *Number of CDMA ranging code in a RNG-REQ message or an MR_Code-REP header*



(a) Response latency for using MR_Code-REP header



(b) Response latency for using RNG-REQ message

Figure 2 Response latencies of 2-hop and 3-hop scenarios

Table 3 Minimum latency for multi-hop systems

Hop count	*Latency (5-ms frame)*			
	RNG-REQ		*MR-Code-REP*	
	frame	*ms*	*frame*	*ms*
2	**7**	**35**	**5**	**25**
3	13	65	**9**	**45**
4	19	95	13	65

3. The MR-BS in the transparent mode may receive the MS ranging code directly or indirectly through the RS. If the MS ranging is received by the MR-BS and RS, the T48 timer is triggered immediately as soon as received by MR-BS. If the MS ranging could only be received by the RS, the T48 timer is triggered after MR-BS receiving the relaying message with the MS ranging code from the RS. Therefore, the actual waiting time for the MR-BS is the T48 plus the latency of relayed MS ranging code. In order to resolve this issue, the value of T48 timer under the indirect scenario, where only the RS receives the MS ranging code, must be adjusted by the latency of relaying MS ranging code, such that the actual waiting is equal to the value of T48 for the direct scenario, where the MR-BS receives the MS ranging code directly.

   For example, in an indirect scenario described in the right one of figure 3 with T48 set to 5 frame (25 ms for 5-ms frame), MR-BS receives the relaying MS ranging code from RS at 5th frame after MS sends initial ranging code, and then sends RNG-RSP (or CDMA allocation IE) at 11th frame. Thus, the minimum latency of initial or periodic ranging is 55ms. If we consider the implementation safety margin, the value of T48 is at least 6 frames (30 ms). Thus, the latency will be at least 13 frames (65 ms), which is larger than the value of T3 timer (60 ms for initial or periodic ranging). Hence, the latency becomes unacceptable since the T3 timer at MS side has already been expired. Hence, the adjusted value of T48 for the indirect scenario should be 30 ms (original T48) minus 25 ms (latency of relaying MS ranging code).

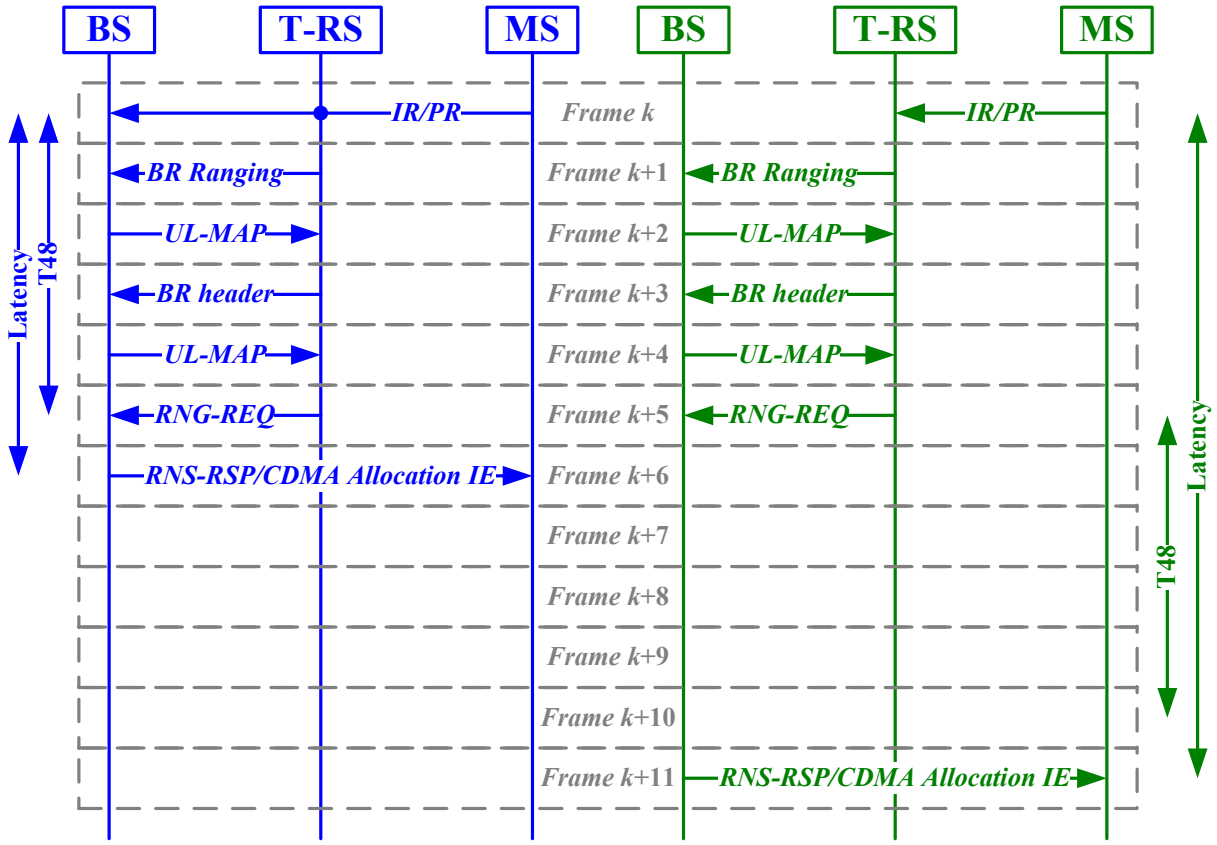


Figure 3 Response latency and T48 timer for using RNG-REQ message

4. In the draft document (line 37 of page 89), it says that "When the MR-BS receives initial ranging code or RNG-REQ containing initial ranging code with RS basic CID at the first time, it shall wait for RNG-REQ with the same ranging code from its subordinate RSs for T48 timer. Once T48 timer expired, the MR-BS compares measured signal information at each station to decide the most appropriate path to communicate with the code originating MS, according to channel measurement information." Since the MR-BS is the only one who decides the ranging “Status” after comparing measured signal information from each access station, we propose to remove “Status = Continue” and “Status = Success” associated with the RS in diagrams such that diagrams are consistent with the text.

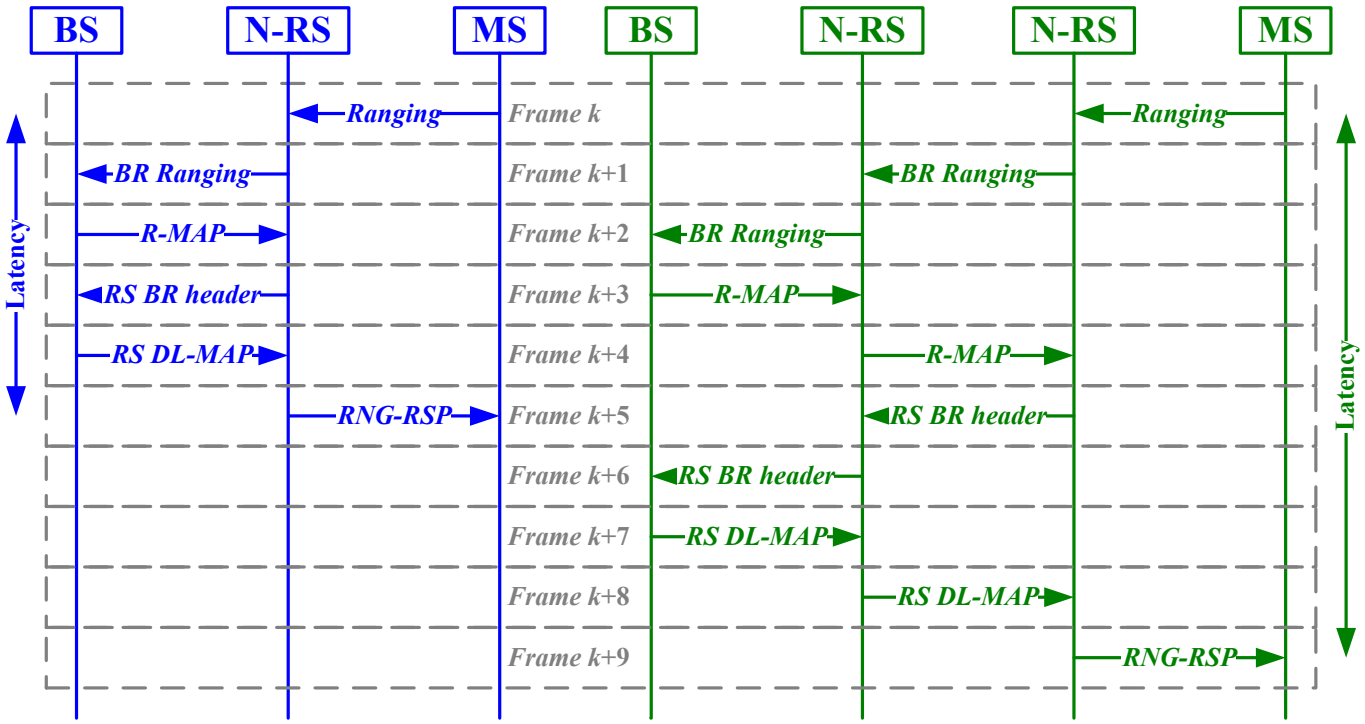
5. In the draft standard, the non-transparent RS under centralizing scheduling shall locally broadcast RNG-RSP message(s) on the access link. In order to broadcast RNG-RSP message, first RS must send CDMA BR ranging to request 6-byte uplink bandwidth allocation for sending RS BR header; then the RS must send RS BR header to MR-BS to request downlink bandwidth for the RNG-RSP message). Because of the limitation of T3 timer (60 ms for initial or periodic ranging), the current scheme cannot be used to request BW for the RS with hop-count more than three, therefore, the latency needs to be reduced. In order to shorten latency during the ranging procedure, we suggest that either the MR-BS should pre-schedule proper UL bandwidth in relay link for sending RS BR header to the MR-BS after allocating Ranging channel in the RS access link or the RS should use dedicated ranging code to request BW on its access downlink (for SS) for sending a RNG-RSP message. The advantage of using RS BR header is to handle reporting multiple CDMA code more efficiently. That is, initial, periodic, BR ranging and handover ranging codes receiving in a frame could be handled by one RS BR header message as multiple codes.

   The response latencies for using anonymous ranging code for sending RS BR header (to request bandwidth to send RNG-RSP), using dedicated uplink bandwidth for sending RS BR header, and using dedicated ranging code for sending RNG-RSP are described in Figure 4. In Figure 4, the minimum latency of CDMA ranging response for 2-hop and 3-hop are 5 and 9 frames (25 and 45 ms for 5-ms frame). Furthermore, the minimum latency with hop-count more than four is lager than 13 frames (65 ms for 5-ms frame) and becomes unacceptable since the T3 timer (60 ms for initial or periodic ranging) at MS side has already been expired. The comparisons of response latency are described in Table 4. In order to resolve this issue, we recommend using Feedback Polling IE or dedicated ranging code to shorten the latency (see Figure 1b and 1c), where the minimum response latency for 2-hop and 3-hop scenario are 3 and 5 frames (i.e., 15 and 25 ms for 5-ms frame), respectively.

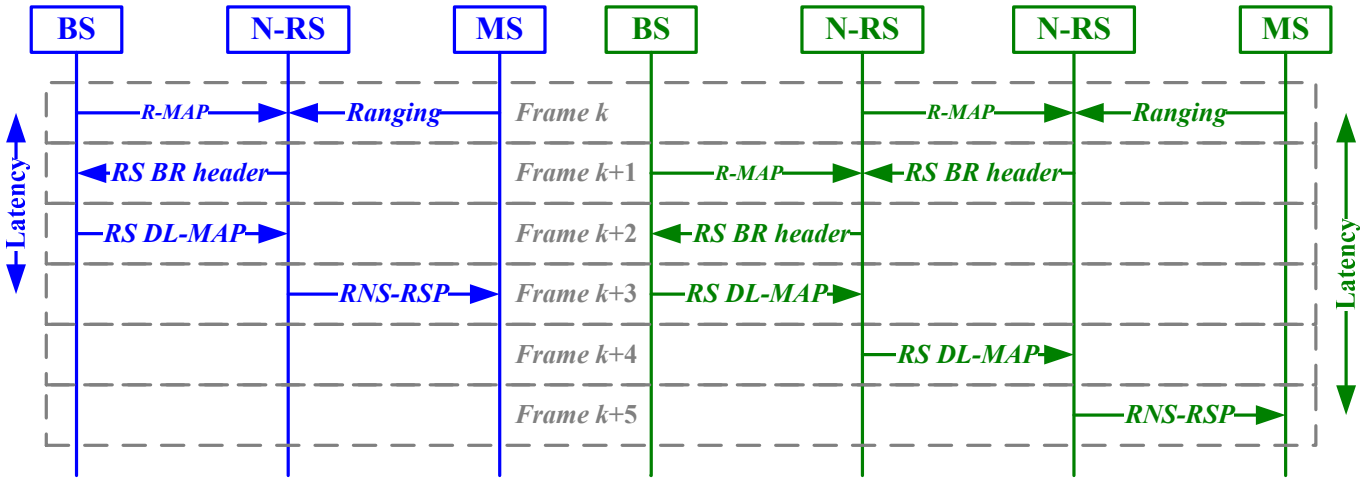
Table 4 Minimum latency for multi-hop systems

Hop count	*Latency (5-ms frame)*			
	(a)		*(b) and (c)*	
	frame	*ms*	*frame*	*ms*
2	**5**	**25**	**3**	**15**
3	**9**	**45**	**5**	**25**
4	13	65	**7**	**35**
5	17	85	**9**	**45**
6	21	105	**11**	**55**
7	25	125	13	65

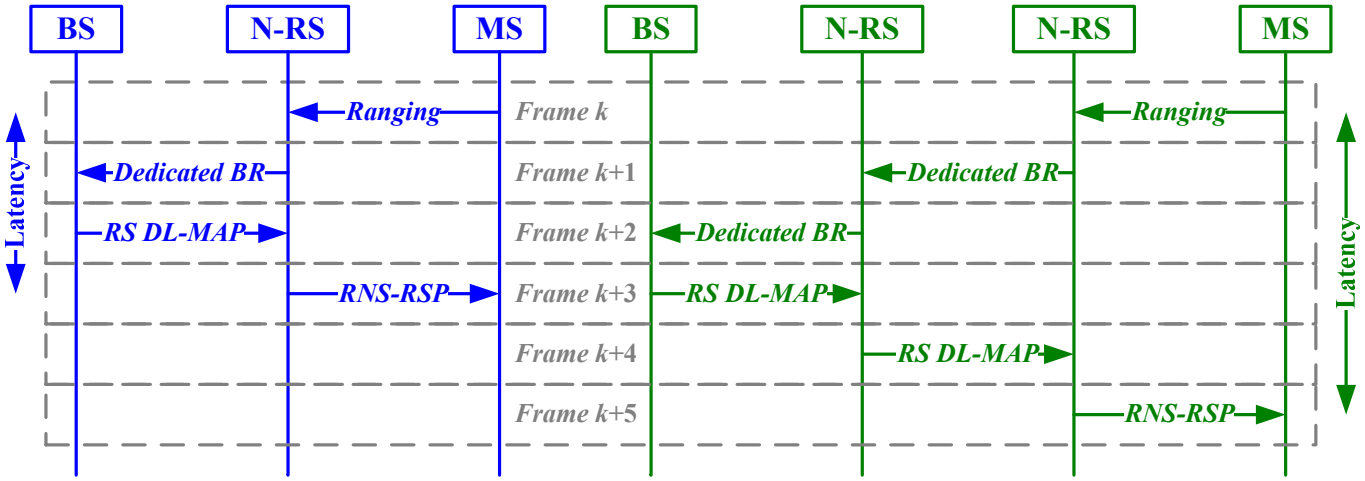
In order to facilitate the incorporation of this proposal into IEEE 802.16j standard, specific changes to the draft standard P802.16j/D1 are listed below.



(a) Using anonymous ranging code for sending RS BR header to request bandwidth to send RNG-RSP



(b) Using dedicated uplink bandwidth for sending RS BR header to request bandwidth to send RNG-RSP



(c) Using dedicated ranging code for sending RNG-RSP

Figure 4 Latencies during the ranging procedure for 2-hop and 3-hop scenarios

Specification Changes

6.3.2.1.2.2.2.5 MR_Code-REP header

[Change the following table in line 24 of page 15 as indicated]

Table xxx Description of fields in MR_Code-REP header

Name	Length	Description
HT	1 bit	= 1
EC	1 bit	= 1
Type	1 bit	= 1
Extended Type	3 bits	= 5
Frame Number Index	4 bits	LSBs of relevant frame number
Number of Received IR CDMA Codes	4 bits	Number of CDMA initial ranging code that requires no correction
Number of Received HR CDMA Codes	4 bits	Number of CDMA handover ranging code that requires no correction
Number of Received BR CDMA Codes	6 bits	Number of CDMA bandwidth request ranging code
~~Reserved~~	~~12 bits~~	
Basic CID	16 bits	RS basic CID
HCS	8 bits	Header Check Sequence (same usage as HCS entry in Table 5).

[Inserted the new subclause 6.3.6.7.2.3 as indicated:]

6.3.6.7.2.3 Bandwidth request and grant in RS down stream access link

The non-transparent RS with different preamble shall send an RS BR header or the associated dedicated CDMA code to request downstream bandwidth for broadcasting the RNG-RSP messages on RS access link, and shall send an MR_Code-REP header to request CDMA_Allocation_IE with zeroed out fields, from the MR-BS. The MR-BS may pre-schedule proper UL bandwidth in relay link for sending RS BR header to the MR-BS after allocating ranging channel in the RS access link.

Upon receiving the RS BR header or the dedicated CDMA code, the MR-BS shall allocate resources for the transmission of the RNG-RSP messages.

Upon receiving the MR_Code-REP header, the MR-BS may allocate resources for the transmission of the RNG-RSP messages with status “Abort” and downlink frequency override if necessary, according to the policies. Otherwise, the MR-BS shall send an CDMA_Allocation_IE with zeroed out fields; refer to subclause 6.3.6.7.2.1, and may allocate resources for the transmission of the RNG-RSP messages with status “Success”.

The MR-BS shall indicate the resource allocated on RS access link with RS_BW-Alloc_IE in the R-MAP.

[Move Figure 108d to here, and modified it as following indicated:]

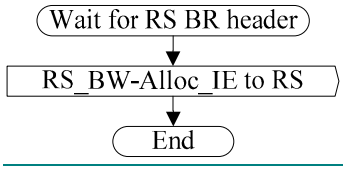


Figure xxx— Handling RS_BR header at an MR-BS

[Replaced the following subclause as indicated:]

6.3.10.3.1 Contention-based initial ranging and automatic adjustments

A SS/MS that wishes to perform initial ranging shall take the following steps:

— The SS/MS, after acquiring downlink synchronization and uplink transmission parameters, shall select one Ranging Slot using the random backoff. The random backoff shall use a binary truncated exponent algorithm. After selecting the Ranging Slot, the SS/MS shall choose a Ranging Code (from the Initial Ranging domain) using a uniform random process. The selected Ranging Code is sent to the BS/MR-BS

(as a CDMA code) in the selected Ranging Slot.

— The BS/MR-BS cannot tell which SS/MS sent the CDMA ranging request; therefore, upon successfully receiving a CDMA ranging code directly or indirectly, the BS/MR-BS broadcasts a ranging response message that advertises the received ranging code as well as the ranging slot (OFDMA symbol number, subchannel, etc.) where the CDMA ranging code has been identified. This information is used by the SS/MS that sent the CDMA ranging code to identify the ranging response message that corresponds to its ranging request. The ranging response message contains all the needed adjustment (e.g., time, power, and possibly frequency corrections) and a status notification.

— Upon receiving a ranging response message with Continue status, the SS/MS shall continue the ranging process as done on the first entry (using random selection rather than random backoff) with ranging codes randomly chosen from the initial ranging domain sent on the periodic ranging region.

— When the BS/MR-BS directly or indirectly receives an initial-ranging CDMA code that requires no corrections, the BS/MR-BS shall provide BW allocation for the SS/MS using the CDMA_Allocation_IE to send an RNG-REQ message. Sending the RNG-RSP message with status "Success" is optional.

— Initial ranging process is over after receiving RNG-RSP message, which includes a valid Basic CID (following a RNG-REQ transmission on a CDMA Allocation IE). If this RNG-RSP message includes "continue" indication, the ranging process should be continued using the periodic ranging mechanisms.

— If the RNG-RSP includes an Offset Frequency Adjustment pointing to another channel and it is larger than the value required for a channel bandwidth offset, the SS/MS should synchronize with the new channel indicated in the RNG-RSP.

— The timeout required for SS/MS to wait for RNG-RSP, following or not following CDMA Allocation IE, is defined by T3.

— Using the OFDMA ranging mechanism, the periodic ranging timer is controlled by the SS/MS, not the BS.

Adjustment of local parameters (e.g., Tx power) in an SS/MS as a result of the receipt (or nonreceipt) of a RNG-RSP is considered to be implementation-dependent with the following restrictions:

a) All parameters shall be within the approved range at all times.

b) Power adjustment shall start from the initial value selected with the algorithm described in 6.3.9.5 unless a valid power setting is available from nonvolatile storage, in which case this value may be used as the starting point.

c) Power adjustment shall be capable of being reduced or increased by the specified amount in response to RNG-RSP messages.

d) If, during initialization, power is increased to the maximum value $P_{TX\_IR\_MAX}$ (without a response from the BS) or to its maximum capability (without a response from the BS), it shall wrap back to the minimum.

On receiving an RNG-RSP, the SS/MS shall not transmit until the RF signal has been adjusted in accordance with the RNG-RSP and has stabilized.

A transparent RS received initial ranging code shall take the following steps:

— A transparent RS shall monitor CDMA ranging codes transmitted on the Ranging Channel in the UL-MAP broadcasted by the MR-BS. Upon detecting, the transparent RS shall send an MR_Code-REP message with the RS basic CID or management tunnel CID within T48 time period to the serving MR-BS, which contains one or more received ranging code attribute in a frame and all the needed adjustment (e.g., time, power, and possibly frequency corrections).

— After receiving a CDMA ranging code or an MR_Code-REP message at the first time, the MR-BS with subordinated transparent RSs shall set the T48 timer and wait for the MR_Code-REQ message with matching ranging code attributes from RSs. Once T48 timer expired, the MR-BS shall decide the most appropriate path and the transparent access station to communicate with the code originating SS/MS.

Algorithms or policies to select the path are out of scope of this document.

- If the RNG-REQ message needs to be relayed by a transparent access RS, the MR-BS shall proceed the CDMA_Allocation_IE with an UL_Burst_Receive_IE whose CID is the transparent access RS basic CID.
- A transparent RS, whose CID matches the RS basic CID of the UL_Burst_Receive_IE, shall receive RNG-REQ message on a burst specified by the following CDMA_Allocation_IE, and shall relay the RNG-REQ message to the MR-BS with the RS basic CID or management tunnel CID.

A non-transparent RS with different preamble received initial ranging code shall take the same steps as MR-BS with following modification:

- Under centralized scheduling, the RS may request bandwidth from the MR-BS for broadcasting RNG-RSP message, and shall request CDMA_Allocation_IE with zeroed out fields, from the MR-BS via sending an MR_Code-REP header to the MR-BS; refer to subclause 6.3.6.7.2.3
- Under distributed scheduling, the RS may send MR_Code-REP header to confirm whether the MR-BS can accept a new MS entry request. The MR-BS shall send a RS_BW-Alloc_IE containing number of accepted (success) and rejected (abort) MSs to the RS.
- A RS shall receive RNG-REQ message on a burst specified by the CDMA_Allocation_IE, and shall relay the RNG-REQ message to the MR-BS with the RS basic CID. A localized non-transparent RS, who has been assigned management CIDs from the MR-BS, shall reply the RNG-RSP containing the assigned management CID, and then shall send STA-INFO message to inform the MR-BS a new coming MS or RS.
- A RS shall relay the received RNG-RSP message with the matching MAC address in previous received RNG-REQ message form subordinated MS. Under distributed scheduling, upon receiving the RNG-RSP containing the management CIDs and MS MAC Address from MR-BS, the RS shall add the TLV fields which are managed by the RS.

An RS that wishes to perform initial ranging shall take the same steps as MS with following modification:

- Upon receiving UCD message containing RS_Initial_Ranging_Code TLV from MR-BS, the RS shall use “RS Initial Ranging” code instead of the “Initial Ranging” code.
- After receiving RS Initial Ranging code, MR-BS may send a RNG-RSP containing status = 2 (abort) with preamble indexes of candidate neighbor access stations.
- Upon receiving RNG-RSP containing status abort with preamble indexes, RS shall scan for DL channel of candidate neighbor access stations and perform initial ranging.

The message sequence chart (Table 205) and flow charts (Figure 109, Figure 110, Figure 111, Figure 112and Figure 113) on the following pages define the CDMA initial ranging and adjustment process that shall be followed by compliant SSs and BSs. The message sequence chart (Table 205a, Table 205b, Table 205c, Table 205d and Table 205e) and flow charts (Figure 109, Figure 110, Figure 111, Figure 112a, Figure 112b, Figure 112c, Figure 113a, Figure 113b and Figure 113c) on the following pages define the CDMA initial ranging and adjustment process that shall be followed by compliant SSs/MSs, access RSs and MR-BSs.

[Move Table 199a to here, and modify it as following indicated]

Table ~~199a~~ 205a—Ranging and automatic adjustments procedure in transparent mode

*[Replace “*RNG-REQ *by “*MR_Code-REP*” from line 5 to line 30 of page 91 in this figure]*

[Delete "Status=Continue" at RS side in line 14 of page 91 in this figure]

[Delete "Status=Success" at RS side in line 27 of page 91 in this figure]

[Move the Table 199b, Table 199c and Table 199d to here, and modified them as indicated]

Table ~~199b~~ 205b—Ranging and automatic adjustments procedure in ~~MR~~ non-transparent mode under centralized scheduling

[Replace "RNG-REQ" by "MR-Code-REP header" in line 23 ~ 27 of page 95]

[Replace "DL BW allocation to send RNG-RSP" by "RS_BW-ALLOC_IE" in the whole figure]

Table ~~199c~~ 205c—Ranging and automatic adjustments procedure in ~~MR~~ non-transparent mode under distributed scheduling

Table ~~199d~~ 205d—Ranging and automatic adjustments procedure in non-transparent mode under distributed scheduling with optional availability

Table ~~199e~~ 205e—Ranging and automatic adjustments procedure ~~with optional availability check at RS in MR mode~~ in localized non-transparent mode

[Merge Figure 95 with, Figure 108a and Figure 108h; then move it to here as following indicated:]

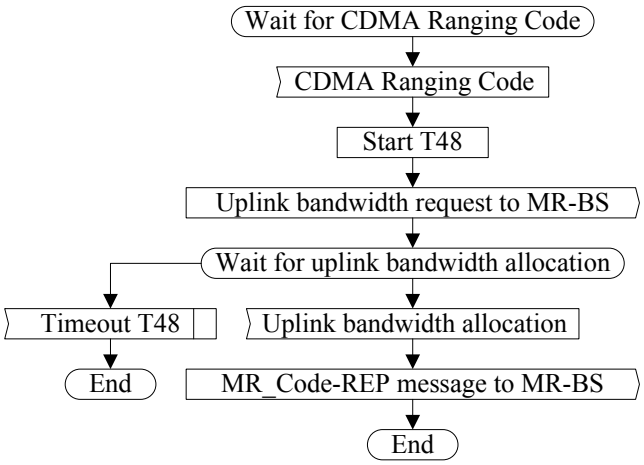


Figure 112a—Handling CDMA ranging code at a transparent RS

[Merge figure 95e with figure 95f, then move it to here, and modified as following indicated:]

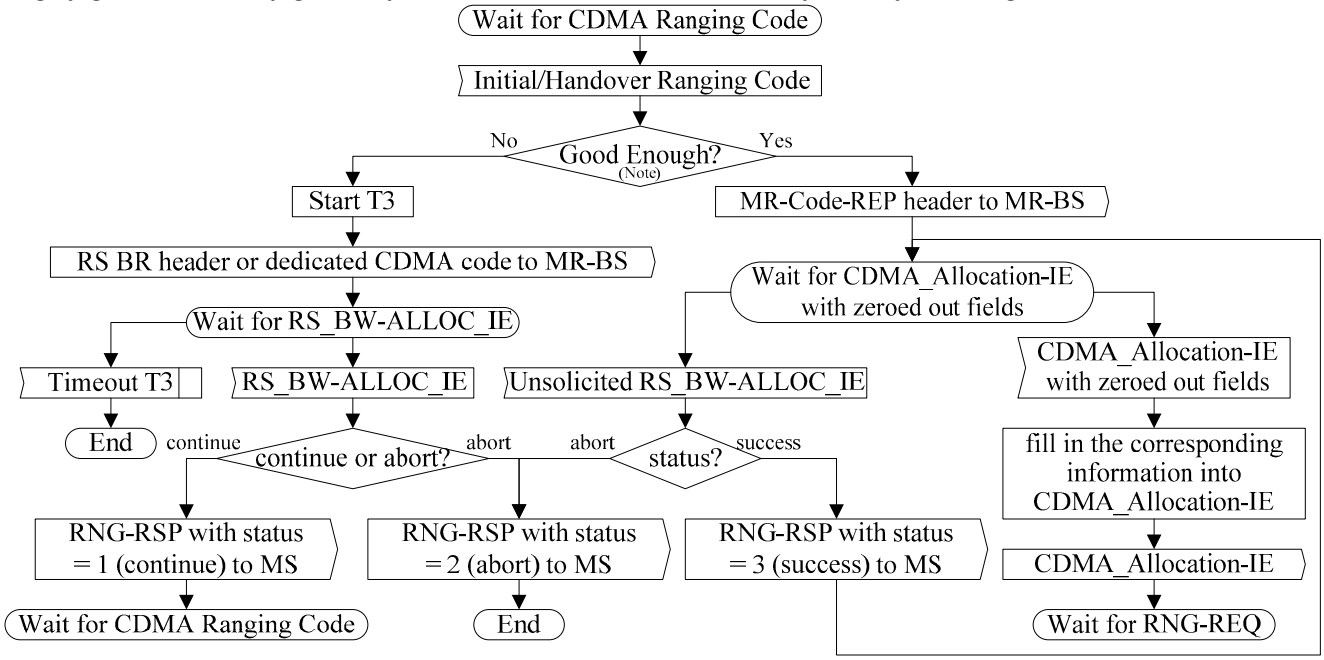


Figure 112b—Handling CDMA initial ranging code at a non-transparent RS with different preamble under centralized scheduling

[Merge Figure 95c with Figure 108b and Figure 108i; then move it to here as following indicated:]

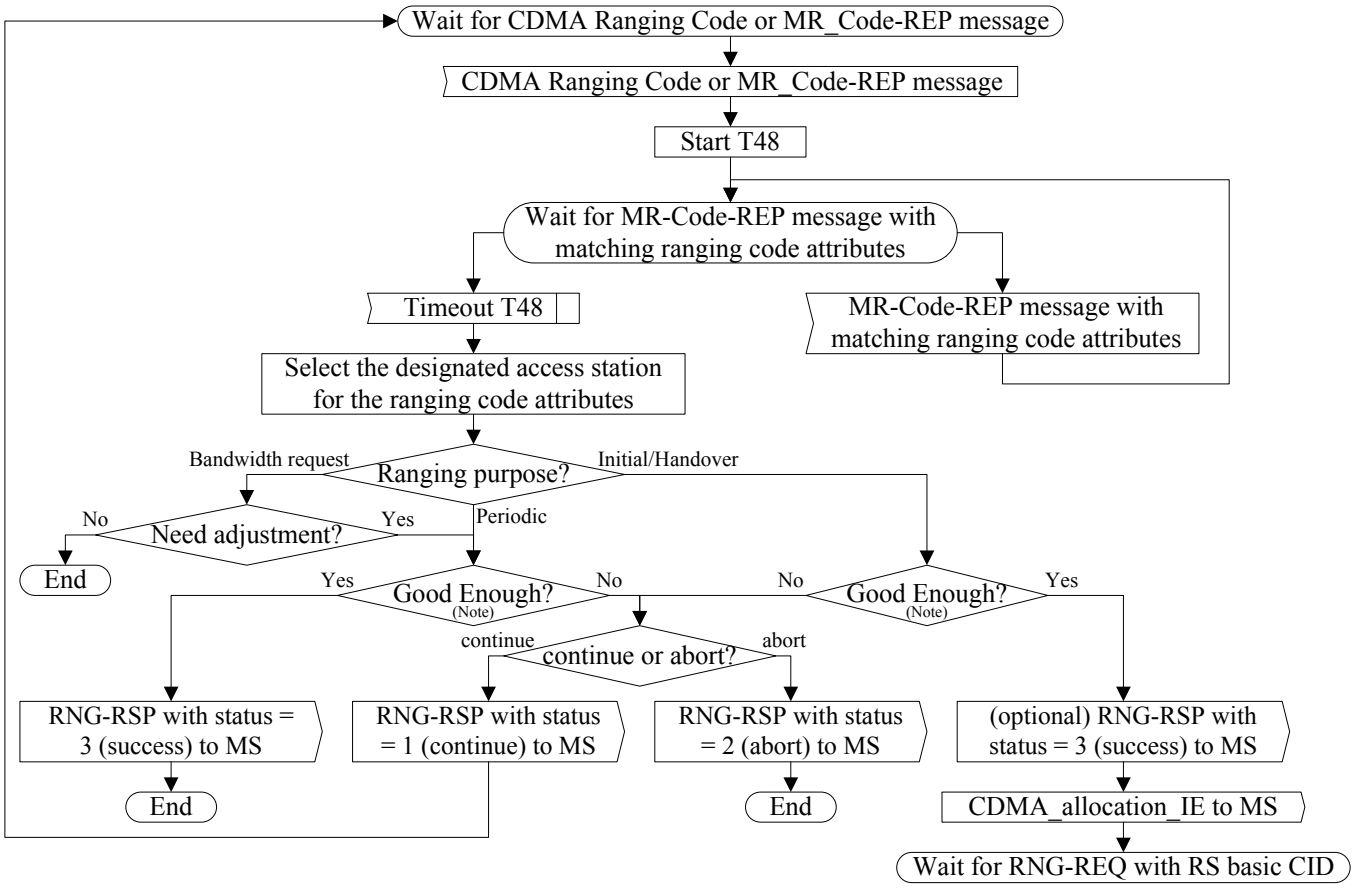


Figure 113a—Handling CDMA ranging code or MR_Code-REP message at an MR-BS

NOTE —Means ranging is within the tolerable limits of the BS.

[Move Figure 95h to here, and modified it as following indicated:]

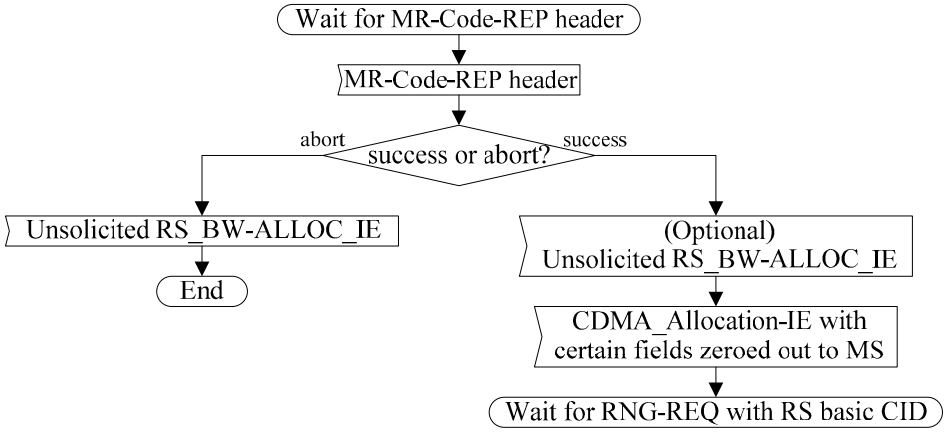


Figure 113b Handling MR_Code-REP at MR-BS

[Move Figure 95b to here and modified it as following indicated:]

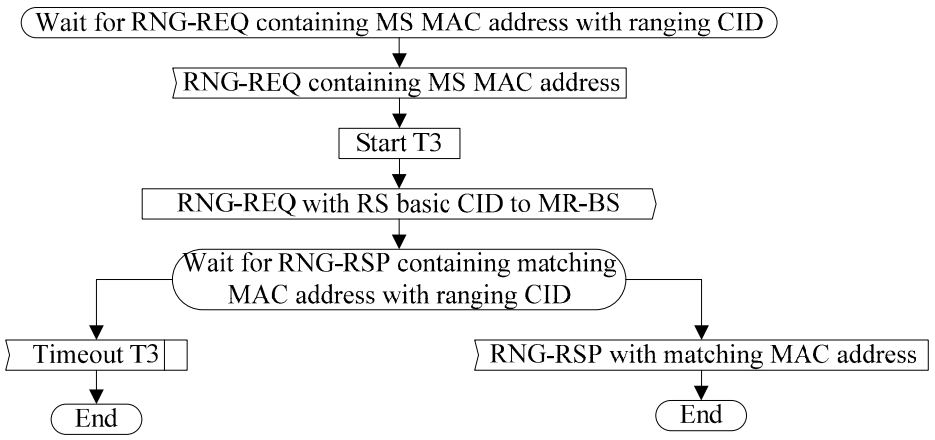


Figure 113c—Handling RNG-REQ at a transparent RS

[Move Figure 95g to here, and modified it as following indicated:]

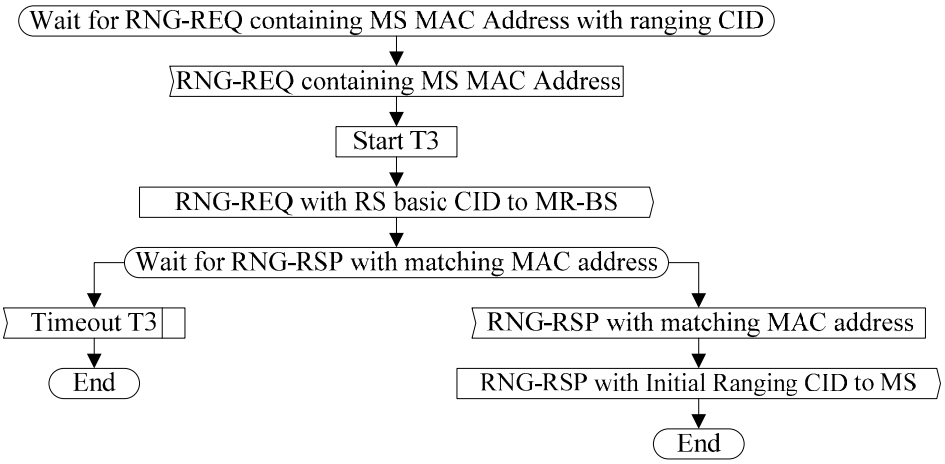


Figure 113d—Handling RNG-REQ at a non-transparent RS

[Inserted the following subclause as indicated:]

6.3.10.3.2 Periodic ranging and automatic adjustments

An SS/MS that wishes to perform periodic ranging shall take the following steps:

- The SS/MS shall choose randomly a Ranging Slot (with random selection with equal probability from available Ranging Slots in a single frame) at the time to perform the ranging, then it chooses randomly a Periodic Ranging Code and sends it to the BS (as a CDMA code).
- If the SS/MS does not receive a response, the SS/MS may send a new CDMA code at the next appropriate periodic ranging transmission opportunity and adjust its power level up to $P_{TX\_IR\_MAX}$ (6.3.9.5.1).
- The BS/MR-BS cannot tell which MS sent the CDMA ranging request; therefore, upon successfully receiving a CDMA periodic ranging code directly or indirectly, the BS/MR-BS broadcasts a ranging response message that advertises the received periodic ranging code as well as the ranging slot (OFDMA symbol number, subchannel, etc.) where the CDMA periodic ranging code has been identified. This information is used by the SS/MS that sent the CDMA periodic ranging code to identify the ranging response message that corresponds to its ranging request. The ranging response message contains all the needed adjustment (e.g., time, power, and possibly frequency corrections) and a status notification.
- Upon receiving a Ranging Response message with continue status, the SS/MS shall continue the ranging process with further periodic ranging codes randomly chosen. Upon receiving a RNG-RSP message with success status, the MS shall restart timer T4.

— Using the OFDMA ranging mechanism, the periodic ranging timer is controlled by the SS/MS, not the BS.

— The BS/MR-BS may send an unsolicited RNG-RSP as a response to a CDMA-based bandwidth-request or any other data transmission from the SS/MS directly or indirectly.

Upon timeout of MS internal T4 timer, the SS/MS shall perform Periodic Ranging according to procedure above.

When the SS/MS receives an unsolicited RNG-RSP message, it shall reset the periodic ranging timer and adjust the parameters (timing and power, etc.) as notified in the RNG-RSP message.

A transparent RS received periodic ranging code shall take the following steps:

— A transparent RS shall monitor CDMA ranging codes transmitted on the Ranging Channel in the UL-MAP broadcasted by the MR-BS. Upon detecting, the transparent RS shall send an MR_Code-REP message with the RS basic CID or management tunnel CID within T48 time period to the serving MR-BS, which contains one or more received ranging code attribute in a frame and all the needed adjustment (e.g., time, power, and possibly frequency corrections).

— After receives a CDMA ranging code or an MR_Code-REP message at the first time, the MR-BS with subordinated transparent RSs shall set the T48 timer and wait for the MR_Code-REQ message with matching ranging code attributes from RSs. Once T48 timer expired, the MR-BS shall decide the most appropriate path and the transparent access station to communicate with the code originating SS/MS. Algorithms or policies to select the path are out of scope of this document.

— An uplink-only transparent RS shall transmit a RNG-REQ message with the RS basic CID or management tunnel CID to request the serving MR-BS to send an unsolicited RNG-RSP, which contains the MS basic CID and all the needed adjustment (e.g., time, power, and possibly frequency corrections).

— A transparent RS may send an unsolicited RNG-RSP as a response to any other data transmission from the subordinate SS/MS, and may request bandwidth on RS access link from the MR-BS for sending RNG-RSP message; refer to subclause 6.3.6.7.2.3.

A non-transparent RS with different preamble received periodic ranging code shall take the same steps as MR-BS with following modification:

— Under centralized scheduling, the RS may request bandwidth from the MR-BS for broadcasting RNG-RSP message; refer to subclause 6.3.6.7.2.3

— A RS may send an unsolicited RNG-RSP as a response to a CDMA-based bandwidth-request or any other data transmission from the SS/MS and may request bandwidth on RS access link from the MR-BS for sending RNG-RSP message; refer to subclause 6.3.6.7.2.3.

An RS that wishes to perform periodic ranging shall take the same steps as the MS with following modification:

— The MR-BS may assign a dedicated periodic ranging code to a RS during network entry. In the periodic ranging process, the dedicated ranging code is used instead of the anonymous ranging code.

The flow charts (Figure 116, Figure 117, and Figure 118) and message sequence chart (Table 206) on the following pages define the CDMA periodic ranging and adjustment process that shall be followed by compliant SSs and BSs. The flow charts (Figure 112a, Figure 113a, Figure 116a, Figure 117a, Figure 117b and Figure 117c) and message sequence chart (Table 206a and Table 206b) on the following pages define the CDMA periodic ranging and adjustment process that shall be followed by compliant SSs/MSs, transparent access RSs and MR-BSs.

[Move Table 201a to here, and modify it as following indicated]

Table ~~201a~~ 206a—Ranging and automatic adjustment procedure in transparent ~~RS system~~ mode

*[Replace "*RNG-REQ*" by "*MR_Code-REP*" in the whole figure]*

[Delete "Status=Continue" at RS side in line 13 of page 110]

[Delete "Status=Success" at RS side in line 24 of page 110]

[Move Table 201b to the subclause 6.3.10.3.7.2, and modify it as following indicated]

Table ~~201b~~ 206a—Ranging and automatic adjustment procedure in non-transparent ~~RS systems~~ mode under ~~(~~centralized~~)~~ scheduling mode

[Replace "DL BW allocation to send RNG-RSP" *by* "RS_BW-Alloc_IE *in whole Table 201b]*

Table ~~201c~~ 206b—Ranging and automatic adjustment procedure in non-transparent ~~RS systems~~ mode under distributed scheduling

[Move Figure 108f and modify it as following indicated]

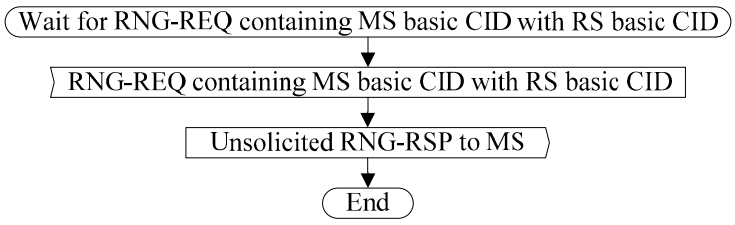


Figure 116a—Handle Handling RNG-REQ at an MR-BS

[Merge Figure 108c, and then move it to here as following indicated:]

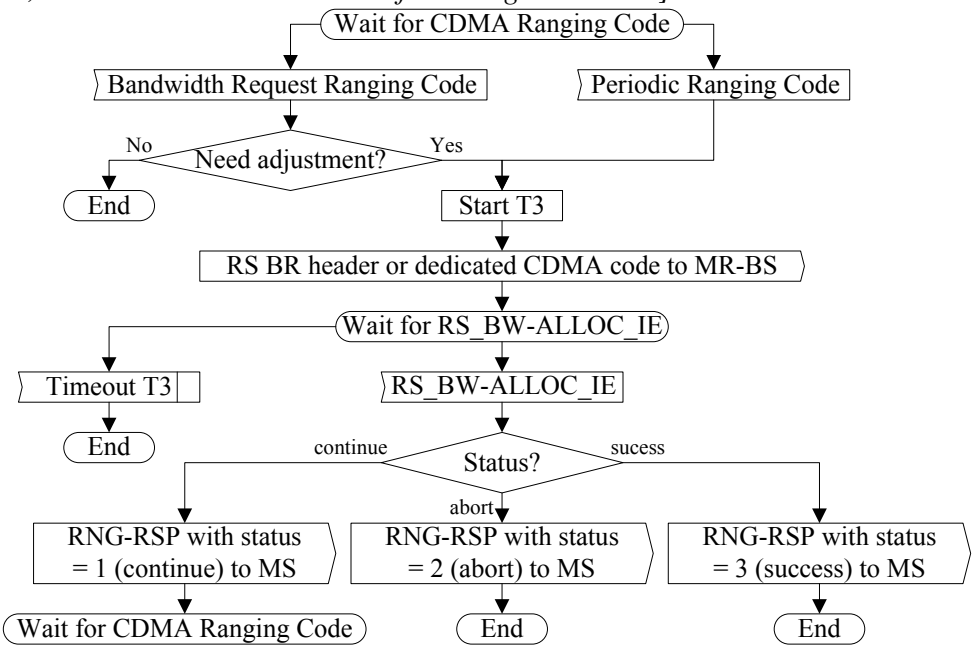


Figure 117a Handling CDMA ranging code at a non-transparent RS

[Move Figure 108f to here, and modify it as following indicated]

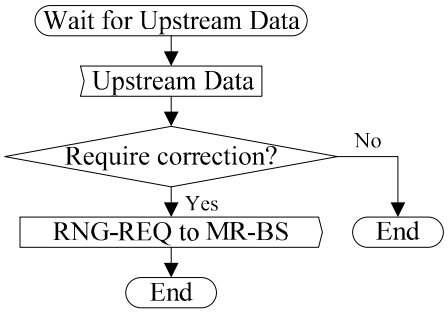


Figure 117b—MS upstream transmission adjustment at an uplink-only transparent RS

[Merge Figure 108f with Figure108j, move it to here, and modify it as following indicated]

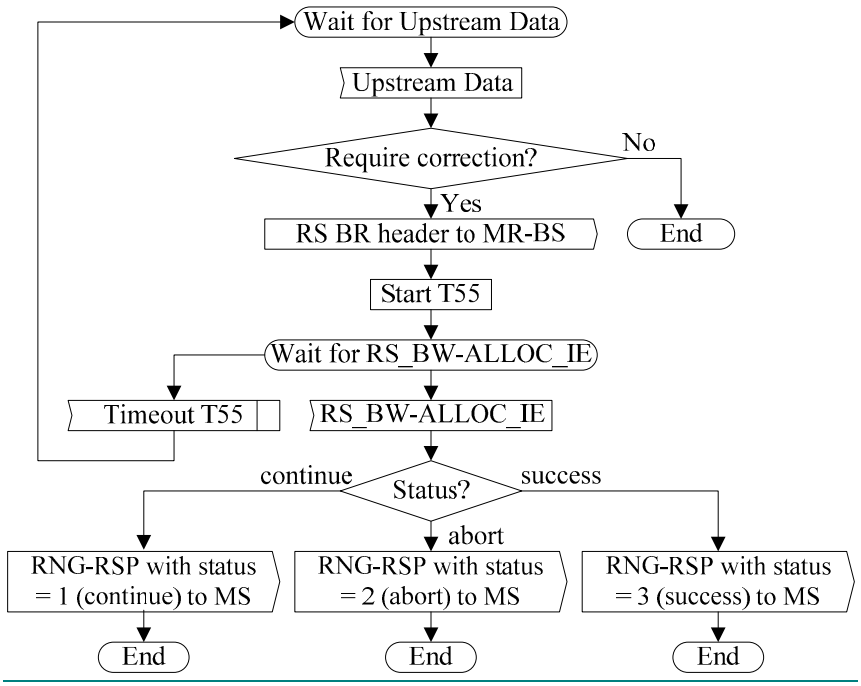


Figure 117c—MS upstream transmission adjustment at a RS under centralized scheduling

[Modified the following subclause as indicated:]

6.3.10.3.3 CDMA HO ranging and automatic adjustment

An MS that wishes to perform HO ranging shall take a process similar to that defined in the initial ranging section with the following modifications.

In CDMA HO ranging process, the random selection is used instead of random backoff and the CDMA HO ranging code is used instead of the initial ranging code. The code is selected from the HO ranging domain as defined in 8.4.7.3.

Alternatively, if the BS/MR-BS or the non-transparent RS with different preamble is prenotified for the upcoming HO MS, it may provide bandwidth allocation information to the MS using Fast Ranging IE to send an RNG-REQ message. If the message needs to be relayed by a transparent access RS, the MR-BS shall proceed the Fast Ranging IE with an UL_Burst_Receive_IE whose CID is the transparent access RS basic CID. A transparent RS, whose CID matches the RS basic CID of the UL_Burst_Receive_IE, shall receive the RNG-REQ message on the burst specified by the following Fast Ranging IE, and shall relay the RNG-REQ message to the MR-BS with the RS basic CID.

[Modified the following subclause as indicated:]

6.3.10.3.4 Dedicated ranging and automatic adjustments

A dedicated ranging is an optional initial ranging which can be used to expedite the ranging process when the ranging is performed as an initial step of a certain procedure such as location determination, coordinated association during scanning, location update in idle mode, etc. For a dedicated ranging, BS/MR-BS will provide dedicated ranging information and allocate the dedicated ranging region at a pre-defined "rendezvous time", in terms of relative frame number. The BS/MR-BS will also assign:

- A unique code number (from within the initial ranging codeset)
- A transmission opportunity within the allocated region (in terms of offset from the start of the region)

The BS/MR-BS may assign the same code or transmission opportunity to more than one MS, but not both. In case all allocated transmission opportunities in current region are different, there is no potential for collision of transmissions from different MSs. In case the BS/MR-BS allocates the same transmission opportunity to several MSs, there is some probability of collision and then BS/MR-BS may fail to identify transmitted codes.

The BS/MR-BS will provide the dedicated ranging information via MAC management messages which are different according to the procedures for which the dedicated ranging is used.

When the "Dedicated ranging indicator" is set to 1, the ranging region will be allocated via UIUC=12 in the UL-MAP.

When "Dedicated ranging indicator" is set to 1, then the ranging region and ranging method defined could be used for the purpose of ranging using dedicated CDMA code and transmit opportunity assigned in the unsolicited RNG-RSP message (for location determination of MS) or in the MOB_SCN-RSP message (for coordinated association).

MSs registered to this BS/MR-BS are prohibited from use of the named ranging region.

Upon receiving one of aforementioned messages which include the dedicated ranging information, the MS should interpret the provided rendezvous time, dedicated code, and transmission opportunity as follows:

- "Rendezvous time" specified the frame in which the BS/MR-BS will transmit a UL-MAP containing the definition of the dedicated ranging region where the MS can use the assigned CDMA ranging code. "Rendezvous time" is provided in units of frames, beginning at the frame where the MAC management message which includes the dedicated ranging information is transmitted.
- The MS shall read the UL-MAP transmitted at the first frame immediately following the rendezvous time and extract the description of the dedicated ranging region (ranging region with "Dedicated ranging indicator" bit set to 1). The MS shall determine the specific region it should use for transmission of the dedicated CDMA code by applying the offset defined by the "transmission opportunity offset" field in the management message, which was received from the BS/MR-BS, to the dedicated ranging region definition in the UL-MAP of the BS. In case the BS/MR-BS decides to provide a regular (non-dedicated) ranging region with "Dedicated ranging indicator" set to 0, the MS may transmit the allocated CDMA code in the regular ranging region.
- If the MS could not obtain UL-MAP at the first frame immediately following the rendezvous time, it shall abort the dedicated ranging process. The MS may perform a contention-based ranging process as described in 6.3.10.3.1.

[Delete the subclause 6.3.9.16.1, 6.3.9.16.2 and 6.3.9.16.4.2 as following indicated]

~~6.3.9.16.1 MS network entry procedures in transparent RS systems~~

~~6.3.9.16.2 MS network entry procedures in non-transparent RS systems~~

~~6.3.9.16.4.2 MS network entry procedure for localized non-transparent RS~~

[Delete the subclause 6.3.10.3.4.1, 6.3.10.3.4.2, 6.3.10.3.4.3, 6.3.10.3.4.4, 6.3.10.3.4.5, 6.3.10.3.4.6 as following indicated]

~~6.3.10.3.4.1 MS periodic ranging and automatic adjustments in transparent RS systems~~

~~6.3.10.3.4.2 MS periodic ranging and automatic adjustments in non-transparent RS systems~~

~~6.3.10.3.4.3 Unsolicited RNG-RSP in transparent RS systems~~

~~6.3.10.3.4.4 Unsolicited RNG-RSP in non-transparent RS systems~~

~~6.3.10.3.4.5 MS CDMA handover ranging and automatic adjustment in RS system~~

~~6.3.10.3.4.6 RS periodic ranging and automatic adjustments with the access station~~

8.4.5.9.3 RS Bandwidth Allocation IE (RS_BW-ALLOC_IE)

[Change the following table in line 38 of page 193 as indicated]

Table 496e—RS_BW-ALLOC_IE format

Name	Length	Description
RS_BW-ALLOC_IE {	-	-
Type	5 bits	0x01
Length	4 bits	variable
RCID_IE()	4,8,12,16 bits	RS basic CID in RCID_IE format (see 8.4.5.3.20.1)
Type	1 bit	0b0: Response for RS BR header 0b1: For RS broadcasting RNG-RSP
If (Type == 0x0) {	-	-
TID	4 bits	Transaction ID
} else if (Type == 0x1) {	-	-
Frame Number Index	4 bits	LSBs of relevant frame number
Number of rejected MS	5 bits	Number of rejected MS (i.e. RNG-RSP message with status “Abort”)
INC_RNG_SUC	1 bit	Include bandwidth for RNG-RSP message with status “success” (0b0: no, 0b1: yes)
INC_DFO	1 bit	Include bandwidth for RNG-RSP message containing downlink frequency override (0b0: no, 0b1: yes)
}	-	-
DL-MAP IE index	8 bits	RS shall transmit message on the burst described by the k-th DL-MAP IE within the DL-MAP message broadcasted by the RS, where *k* is the DL-MAP IE index
}	-	-

10.1 Global values

[Modified the following Table 583 in line 9 of page 202 as indicated:]

Table 583—Parameters and constants

System	Name	Time reference	Minimum value	Default value	Maximum value
MR-BS	T48	Wait for ~~RNQ-REQ~~ MR_Code-REP message from the subordinate RS	tbd	~~tbd~~ $T48_{CDMA}$ = TBD. $T48_{Message} = T48_{CDMA} - T_{FD} \times ((FN_{Rx} - FN_{Msg}) \bmod 256)$, where T_{FD}: the frame duration, FN_{Rx}: the relevant frame number when receiving message, FN_{Msg}: the frame number in the received message	T3