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Re:	IEEE802.16j-06/027: “Call for Technical Proposals regarding IEEEP802.16j”
Abstract	This contribution proposes MS network entry procedures and additional TLVs in transparent Relay Station systems.
Purpose	To propose text to describe MS network entry in ~~non-~~transparent Relay Station systems
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MS Network Entry for transparent Relay Station

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Introduction

This contribution proposes MS network entry procedure and additional TLVs in transparent RS systems.

The transparent RS does not transmit preamble and MAPs. A MS synchronizes with the MR-BS and receives MAPs from it, while downstream/upstream traffic is relayed. Therefore, it does not recognize existence of the RS even though it communicates with the MR-BS via the transparent RS. In the relay network, MS shall follow the legacy network entry and initialization procedures for backward compatibility. RS is involved in for message detection and relaying. In MS initialization, MS may be located in the overlapped area covered by several RSs and MR-BS. MR-BS shall make a determination as to appropriate access station for the MS to achieve an optimal MS-BS path. In other words, MR-BS should decide whether RS or which RS is required for a specified MS. For the purpose of the optimal path selection, MS-RS link quality shall be measured and reported to MR-BS.

Figure A-1 illustrates an example of transparent RS system.

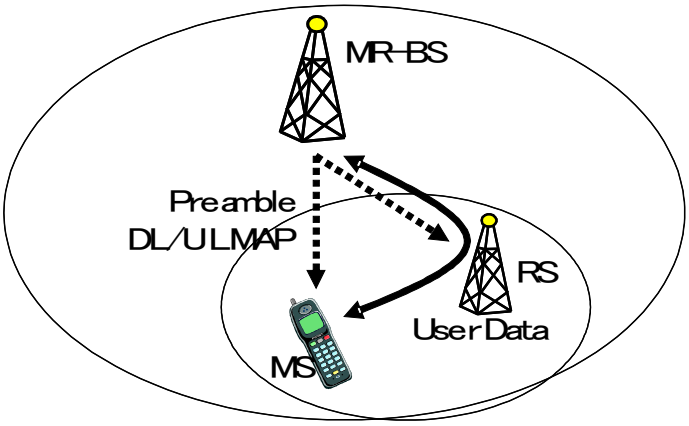


Figure A-1 Example of transparent RS system

This contribution describes detail messages sequence and RS and MR-BS behavior during ranging process and additional new TLVs, so that the MR-BS can decide the appropriate path (direct or relaypath) for each MS.

Specific Text Changes

Insert the new subclause 6.3.9.16.1 (in "Support for network entry and initialization in relay mode"):

6.3.9.16.1 MS network entry procedures in transparent RS systems

In network entry procedure in transparent RS systems, MS scans for downlink channel and establish synchronization with the MR-BS, then obtains transmit parameters from UCD message as described in 6.3.9.1 through 6.3.9.4.

The initial ranging process shall begin by sending initial-ranging CDMA codes on the UL allocation dedicated for that purpose (for more details see 6.3.10.3). The RS shall monitor ranging channel assigned by the MR-BS.

The code may be received by the MR-BS and some RSs near the MS. RSs receiving the code with sufficient signal quality shall transmit a RNG-REQ to the MR-BS with the RS basic CID. The RNG-REQ message contains ranging status, code attributes and adjustment information such as frequency, timing and transmission power. When a RS receives multiple codes in a frame, the RS sends a RNG-REQ message which contains information of multiple codes which are received with sufficient signal quality.

When the MR-BS receives ranging code, it shall wait for RNG-REQ 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 appropriatepath to communicate with the code originating MS, according to channel measurement information. Algorithms to select a path are out of scope of this document.

When the ranging status at the selected path is continue, the MR-BS transmits a RNG-RSP to the MS directly with initial ranging CID. The RNG-RSP shall contain adjustment information measured at the RS on the selected path. If the ranging code has been successfully received at the RS on the selected path and the MR-BS decides to apply uplink and downlink relaying to the MS, the MR-BS transmits a RNG-RSP to the RS with the RS's basic CID in order to notify the RS to receive and relay a RNG-REQ message transmitted on a burst specified with CDMA_Allocation-IE in UL-MAP. If the direct communication is selected, the MR-BS follows sequence described in 6.3.10.3.

Once the RS receives a RNG-REQ containing MSID with initial ranging CID, it forwards the message to the MR-BS with the RS basic CID, so that the MR-BS can identify the RS with which the MS connects.

Receiving the RNG-REQ, the MR-BS assigns basic and primary CID to the MS and sends back the RNG-RSP containing the management messages with the RS basic CID. The RS relays it to the MS with changing the CID to the initial ranging CID.

After assigning the basic and primary CID to the MS, the MS and the MR-BS continue network entry process as described in the 6.3.9.7 through 6.3.9.13 using the MS's management CIDs. The RS on the selected path shall relay messages between them. The RS may monitor management messages and derive some information for some purpose which is out of scope of this document.

The message sequences chart (Table xxx) and flow charts (Figure xxx, Figure xxx, and Figure xxx) on the following pages define the ranging and adjustment process that shall be followed by compliant RSs and MMR-BSs. For CDMA ranging process between RS and MS, these details can be found in 6.3.10.3.

Optionally, the MS network entry process in transparent RS system will proceed with relaying of messages and data on uplink only, while relying on the direct MR-BS to MS transmissions on the downlink. The message sequence chart for this process is provided in Table yyyy.

When the MR-BS decides to apply uplink only relaying to the MS, it send a duplicate RNG-RSP to the RS as well as a RNG-RSP to the MS. The duplicate RNG-RSP shall be transmitted with the RS's basic CID and contain the Ranging Method TLV in addition to information in the RNG-RSP sent to the MS in order to notify the RS of relaying uplink traffic from the MS. The duplicate RNG-RSP is never relayed to the MS.

Table xxxx Ranging and automatic adjustments procedure in MR mode

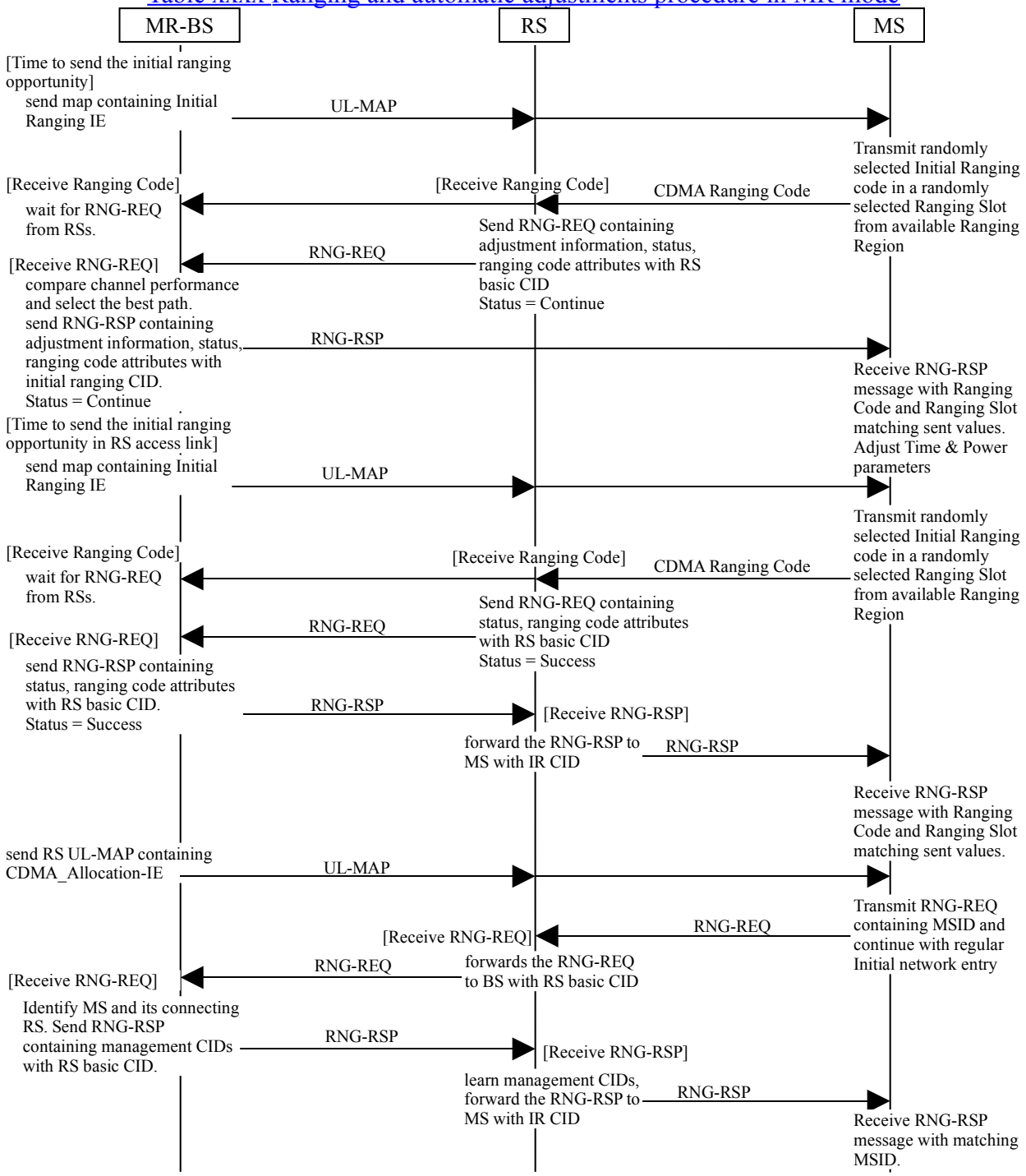
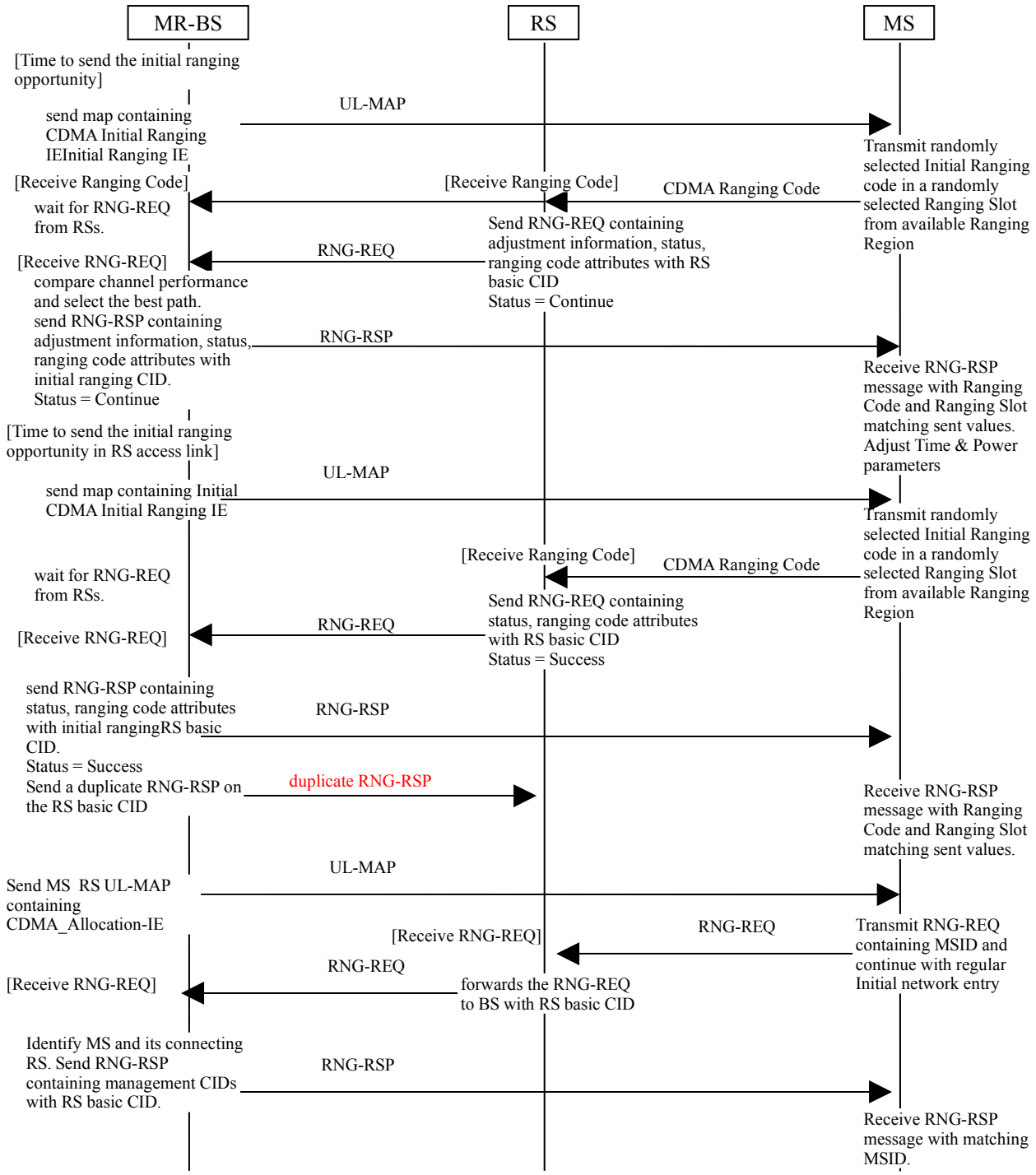


Table yyy Ranging and automatic adjustments procedure in MR mode with optional UL only relaying


MR-BS
RS
MS
[Time to send the initial ranging opportunity]
send map containing CDMA Initial Ranging IEInitial Ranging IE
UL-MAP
Transmit randomly selected Initial Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]
[Receive Ranging Code]
CDMA Ranging Code
wait for RNG-REQ from RSs.
Send RNG-REQ containing adjustment information, status, ranging code attributes with RS basic CID
Status = Continue
RNG-REQ
[Receive RNG-REQ]
compare channel performance and select the best path.
send RNG-RSP containing adjustment information, status, ranging code attributes with initial ranging CID.
Status = Continue
RNG-RSP
Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values. Adjust Time & Power parameters
[Time to send the initial ranging opportunity in RS access link]
send map containing Initial CDMA Initial Ranging IE
UL-MAP
Transmit randomly selected Initial Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]
CDMA Ranging Code
wait for RNG-REQ from RSs.
Send RNG-REQ containing status, ranging code attributes with RS basic CID
Status = Success
RNG-REQ
[Receive RNG-REQ]
send RNG-RSP containing status, ranging code attributes with initial rangingRS basic CID.
Status = Success
RNG-RSP
Send a duplicate RNG-RSP on the RS basic CID
duplicate RNG-RSP
Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values.
Send MS RS UL-MAP containing CDMA_Allocation-IE
UL-MAP
[Receive RNG-REQ]
RNG-REQ
Transmit RNG-REQ containing MSID and continue with regular Initial network entry
RNG-REQ
[Receive RNG-REQ]
forwards the RNG-REQ to BS with RS basic CID
Identify MS and its connecting RS. Send RNG-RSP containing management CIDs with RS basic CID.
RNG-RSP
Receive RNG-RSP message with matching MSID.

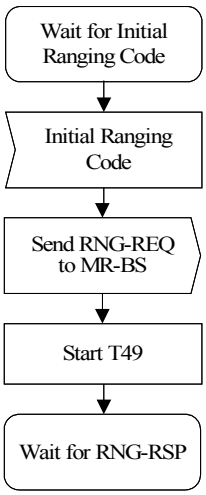


Figure xxx MS CDMA initial Ranging - RS

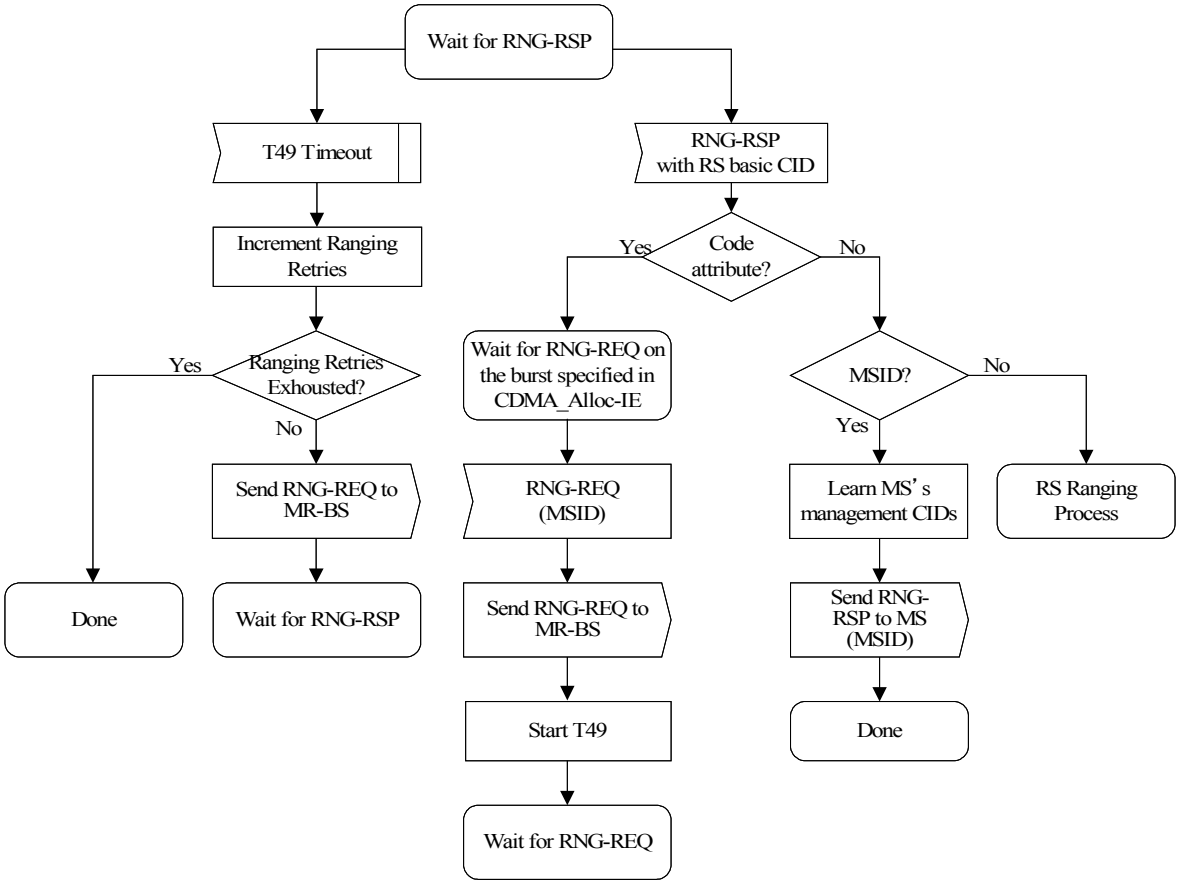


Figure xxx MS initial Ranging - RS

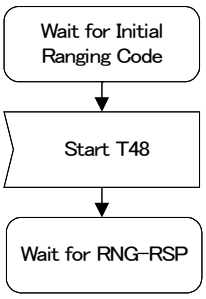


Figure xxx MS CDMA initial Ranging – MR-BS

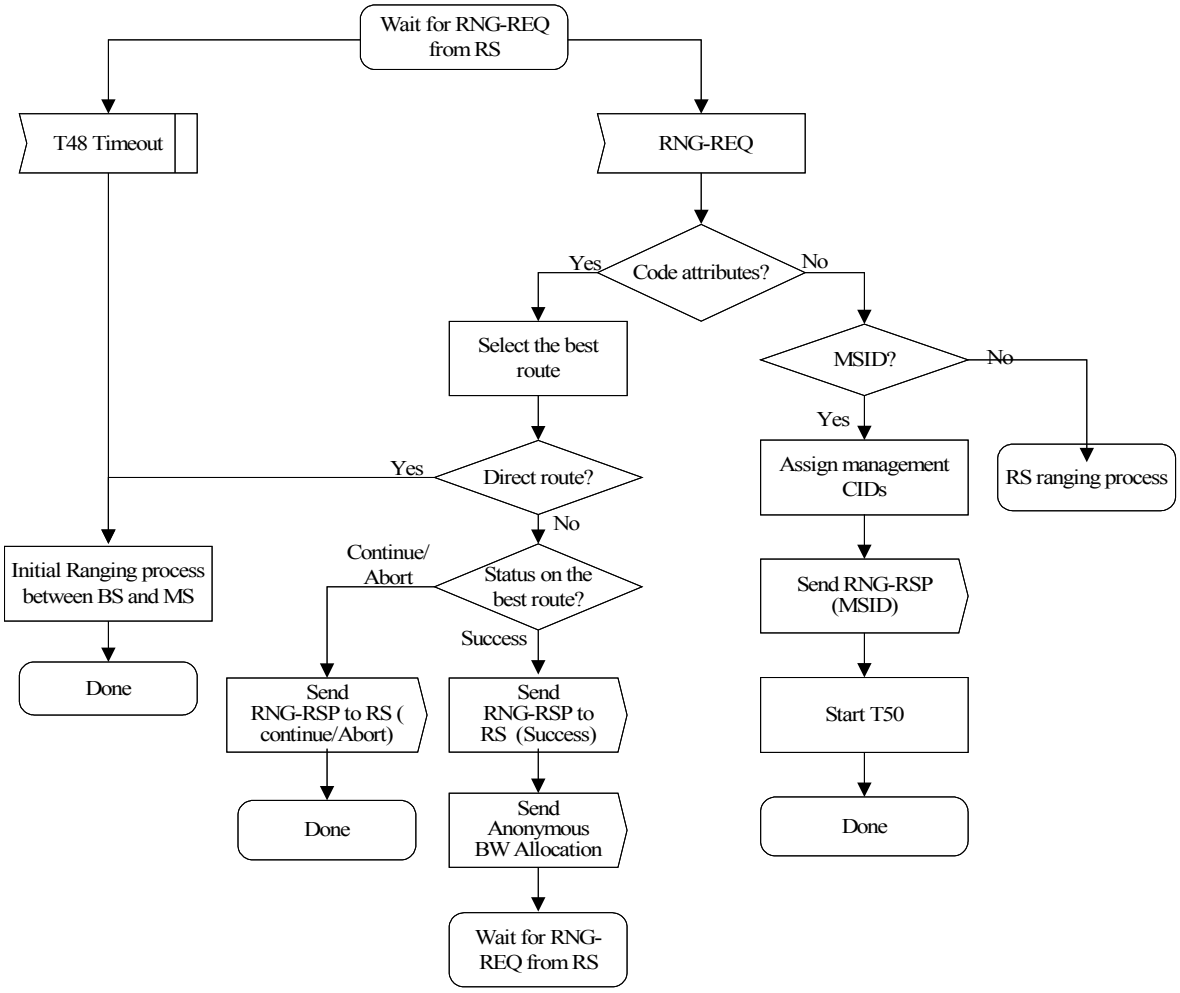


Figure xxx MS initial Ranging – MR-BS

Insert the following rows into Table 342 at 10.1Global Values:

Table 342—Parameters and constants

System	Name	Time reference	Minimum value	Default value	Maximum value
MR-BS	T48	Wait for RNG-REQ from the subordinate RS	tbd	tbd	

RS	T49	Ranging Response reception timeout following the transmission of a Ranging Request to MR-BS		tbd	tbd
MR-BS	T50	Registration Timeout, the time allowed between the MR-BS sending a RNG-RSP (success) to an SS via RS, and receiving a SBC-REQ from that same SS via RS	tbd	tbd	

Insert the following rows into Table 364 at 11.5 RNG-REQ TLV:

Table 364—RNG-REQ message encodings

Name	Type (1 byte)	Length	Value (variable-length)	PHY Scope
Received Ranging Codes	TBA	Variable	Received Ranging Codes is a compound TLV value that indicates received code information.	OFDMA
Timing Adjust	TBA.1	4	Tx timing offset adjustment (signed 32-bit). The amount of time required to adjust SS transmission so the bursts will arrive at the expected time instance at the BS. Units are PHY specific (see 10.3).	OFDMA
Power Level Adjust	TBA.2	1	Tx Power offset adjustment (signed 8-bit, 0.25 dB units) Specifies the relative change in transmission power level that the SS is to make in order that transmissions arrive at the BS at the desired power. When subchannelization is employed, the subscriber shall interpret the power offset adjustment as a required change to the transmitted power density.	OFDMA
Offset Frequency Adjust	TBA.3	4	Tx frequency offset adjustment (signed 32-bit, Hz units) Specifies the relative change in transmission frequency that the SS is to make in order to better match the BS. (This is fine-frequency adjustment within a channel, not reassignment to a different channel.)	OFDMA
Ranging Status	TBA.4	1	Used to indicate whether uplink messages are received within acceptable limits by BS. 1 = continue, 2 = abort, 3 = success	OFDMA
Ranging code attributes	TBA.5	4	Bits 31:22 – Used to indicate the OFDM time symbol reference that was used to transmit the ranging code. Bits 21:16 – Used to indicate the OFDMA subchannel reference that was used to	OFDMA

			transmit the ranging code. Bits 15:8 – Used to indicate the ranging code index that was sent by the SS. Bits 7:0 – The 8 least significant bits of the frame number of the OFDMA frame where the SS sent the ranging code.	
Channel Measurement Information	TBA.6	TBA	TBD	

Insert the following rows into Table 367 at 11.6 RNG-RSP TLV:

Table 367—RNG-RSP message encodings

Name	Type (1 byte)	Length	Value (variable-length)	PHY Scope
Relaying Method	TBA	1	0: Downlink and Uplink relaying (default) 1: Uplink only relaying *2-7: reserved*	OFDMA

References

[1] M.Okuda, “relaying method proposal for 802.16j”, IEEE C802.16j-06_132, IEEE 802.16 meeting #46, Dallas, November 2006.

[2] M.Okuda, et. al, “MS network entry for non-transparent Relay Station with centralized scheduling”, IEEE C802.16j-07_008, IEEE 802.16 meeting #47, London, January 2007.

[3] M.Okuda, et. al, “MS network entry for non-transparent Relay Station with distributed scheduling”, IEEE C802.16j-07_024, IEEE 802.16 meeting #47, London, January 2007.