## Project IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>

### Title
Unsolicited RNG-RSP in Transparent RS System

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### Re:
IEEE 802.16j-07/007r2: “Call for Technical Comments and Contributions regarding IEEE Project 802.16j”

### Abstract
This contribution proposes procedures for unsolicited RNG-RSP in transparent RS system

### Purpose
Text proposal for 802.16j Baseline Document

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Unsolicited RNG-RSP in Transparent RS System

Introduction

This contribution describes MS unsolicited RNG-RSP in transparent RS system. In order to facilitate the incorporation of this proposal into IEEE 802.16j standard, specific changes to the baseline working document IEEE 802.16j-06/026r2 are listed below.

Text Proposal

6.3.10 Ranging
6.3.10.3 OFDMA based ranging
6.3.10.3.4 Relaying support for OFDMA based ranging
6.3.10.3.4.3 Unsolicited RNG-RSP in transparent RS systems

When the offsets of frequency, power, and timing for any other data transmission from the MS are beyond the tolerance defined in this specification, RSs shall transmit a RNG-REQ message with the RS basic CID containing the MS basic CID to the serving MR-BS through the relay path.

Upon receiving the RNG-REQ message from a subordinate RS, the MR-BS may send an unsolicited RNG-RSP message with this MS basic CID to the MS.

After RS received a bandwidth request CDMA ranging code resulting in continue status, it should transmit an RNG-REQ message with the RS basic CID containing the CDMA BR ranging code to the serving MR-BS through the relay path with adjustment information of frequency, power, and timing corrections. When RS receives multiple codes in the ranging subchannel of a frame, the RNG-REQ message sent by the RS to serving MR-BS may contain information of multiple received codes.

When the MR-BS receives a bandwidth request CDMA ranging code resulting in continue status, 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. When it needs to do adjustment for the code, the MR-BS shall broadcast an RNG-RSP with associated code attribute.

The message sequence charts (Table xxx and Table yyy) and flow charts (Figure xxx and Figure yyy) define the unsolicited RNG-RSP process that shall be followed by compliant RSs and MR-BSs.
Table xxx: Unsolicited RNG-RSP triggered by upstream traffic in non-transparent RS system

<table>
<thead>
<tr>
<th>MR-BS</th>
<th>RS</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Time to send the anonymous BW allocation in RS access link] send map containing anonymous BW allocation with MS basic CID</td>
<td>UL-MAP</td>
<td>[Decode UL-MAP]</td>
</tr>
<tr>
<td>[Receive Upstream Traffic] monitor upstream traffic from MS and send RNG-REQ to MR-BS containing the measurement results and MS Basic CID with RS basic CID Status = Continue</td>
<td>Ranging Code</td>
<td>Transmit upstream traffic in the specified BW allocation</td>
</tr>
<tr>
<td>send RNG-RSP containing status, ranging code attributes and MS basic CID with RS basic CID Status = Continue</td>
<td>Ranging Code</td>
<td>Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values. Adjust Time &amp; Power parameters</td>
</tr>
</tbody>
</table>

Table yyy: Unsolicited RNG-RSP procedure triggered by CDMA BR ranging code in transparent RS systems

<table>
<thead>
<tr>
<th>MR-BS</th>
<th>RS</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Time to send the periodic ranging opportunity] send map containing Periodic Ranging IE</td>
<td>UL-MAP</td>
<td>[Receive Ranging Code] CDMA Ranging Code</td>
</tr>
<tr>
<td>[Receive Ranging Code] wait for RNG-REQ from RSs.</td>
<td>Ranging Code</td>
<td>Transmit randomly selected BR Ranging code in a randomly selected Ranging Slot from available Ranging Region</td>
</tr>
<tr>
<td>[Receive RNG-REQ] compare channel performance and select the best path. send RNG-RSP containing status, ranging code attributes with initial ranging CID. Status = Continue</td>
<td>Ranging Code</td>
<td>Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values. Adjust Time &amp; Power parameters</td>
</tr>
</tbody>
</table>

Figure xxx Unsolicited RNG-RSP in Transparent RS system – Transparent Access RS

Wait for RNG-REQ (RS basic CID, MS basic CID)

Send unsolicited RNG-RSP to MS

Done

Monitor upstream data quality

No

Good enough? Yet

Send RNG-REQ (RS basic CID, MS basic CID)

Done

Figure yyy Unsolicited RNG-RSP in Transparent RS system – MR-BS
Figure xxx Unsolicited RNG-RSP triggered by CDMA BR ranging code in Transparent RS system –

Transparent Access RS

Wait for Bandwidth Request Code or RNG-REQ (RS basic CID, MS BR code)

Bandwidth Request Code or RNG-REQ (RS basic CID, MS BR code)

Start T48

Wait for RNG-REQ (RS basic CID, MS BR code) with same BR ranging code attributes

Timeout T48

Select the designated access station

Reported Quality

Yes

Done

No

Send RNG-RSP (continue) to MS

Done

Figure yyy Unsolicited RNG-RSP triggered by CDMA BR ranging code in Transparent RS system– MR-BS

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

<table>
<thead>
<tr>
<th>System</th>
<th>Name</th>
<th>Time reference</th>
<th>Minimum value</th>
<th>Default value</th>
<th>Maximum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR-BS</td>
<td>T48</td>
<td>Wait for RNG-REQ from the subordinate RS</td>
<td>tbd</td>
<td>tbd</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Type (1 byte)</th>
<th>Length</th>
<th>Value (variable-length)</th>
<th>PHY Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received Ranging Codes</td>
<td>TBA</td>
<td>Variable</td>
<td>Received Ranging Codes is a compound TLV value that indicates received code information.</td>
<td>OFDMA</td>
</tr>
<tr>
<td>Timing Adjust</td>
<td>TBA.1</td>
<td>4</td>
<td>Tx timing offset adjustment (signed 32-bit).</td>
<td>OFDMA</td>
</tr>
<tr>
<td>Description</td>
<td>TBA Code</td>
<td>Value</td>
<td>Description</td>
<td>OFDMA</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------</td>
<td>-------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Power Level Adjust</td>
<td>TBA.2</td>
<td>1</td>
<td>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.</td>
<td>OFDMA</td>
</tr>
<tr>
<td>Offset Frequency Adjust</td>
<td>TBA.3</td>
<td>4</td>
<td>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.)</td>
<td>OFDMA</td>
</tr>
<tr>
<td>Ranging Status</td>
<td>TBA.4</td>
<td>1</td>
<td>Used to indicate whether uplink messages are received within acceptable limits by BS.</td>
<td>OFDMA</td>
</tr>
<tr>
<td>Ranging code attributes</td>
<td>TBA.5</td>
<td>4</td>
<td>Bits 31:22 – Used to indicate the OFDM time symbol reference that was used to transmit the ranging code.</td>
<td>OFDMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bits 21:16 – Used to indicate the OFDMA subchannel reference that was used to transmit the ranging code.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bits 15:8 – Used to indicate the ranging code index that was sent by the SS.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bits 7:0 – The 8 least significant bits of the frame number of the OFDMA frame where the SS sent the ranging code.</td>
<td></td>
</tr>
<tr>
<td>Channel Measurement Information</td>
<td>TBA.6</td>
<td>TBA</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>MS Basic CID</td>
<td>TBA.7</td>
<td>2</td>
<td>MS Basic CID</td>
<td>OFDMA</td>
</tr>
</tbody>
</table>