Relay amble sequence

This contribution contains a technical proposal for an amble sequence that can optionally be transmitted by an MR-BS or RS at the start of a R-DL zone or as a relay postamble at the end of the DL subframe. This so called “relay postamble” or “relay zone preamble” can be received by an RS instead of the frame start preamble transmitted in the access link when the RS is transmitting its own frame start preamble.
Relay amble sequence
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Introduction
Based on the frame structure accepted into the baseline document [1] in meeting #46 it is not practical for a non-transparent RS to receive frame start preamble (a.k.a. access preamble) transmissions during operation due to the fact that they are also required to transmit frame start preambles to support connection of SS as defined in IEEE Std. 802.16.

As a consequence, the introduction of an optional relay amble in the form of either a relay zone preamble or relay postamble used for transmission from an MR-BS or RS has been proposed [2][3]. This proposal defines the set of sequences that can be used for the relay zone preamble or relay postamble, referred generically to as the relay amble throughout the remainder of this contribution.

The relay amble is designed to have properties very similar to the frame start preamble to minimize the impact on the existing standard and also enable reuse of existing technology defined for SS/MS receiver at the RS receiver. However, it is modified such that an SS/MS will not accidentally receive and interpret a relay amble as a frame start preamble.

Relay amble properties
The properties of the proposed relay amble are summarized in Table 1.

Table 1. Relay amble properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Preamble</th>
<th>Relay amble</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>1 symbol</td>
<td>1 symbol</td>
<td></td>
</tr>
<tr>
<td>Sequence type &amp; subcarrier allocation</td>
<td>As defined in 8.4.6.1.1 of IEEE Std. 802.16</td>
<td>As defined in 8.4.6.1.1 of IEEE Std. 802.16</td>
<td>Sequence type and subcarrier allocation technique is the same as that used for the preamble.</td>
</tr>
<tr>
<td>Power</td>
<td>+9dB</td>
<td>+6dB</td>
<td></td>
</tr>
<tr>
<td>Repetition rate</td>
<td>Every frame</td>
<td>Flexible</td>
<td>See [3].</td>
</tr>
<tr>
<td>Location (in subframe)</td>
<td>Fixed (first symbol)</td>
<td>Flexible / Fixed (last symbol in DL subframe)</td>
<td>See [3]. Note relay zone preamble, if present, is always the first symbol in a R-DL zone interval.</td>
</tr>
<tr>
<td>Status</td>
<td>M</td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

In summary, the sequence used for the relay amble is the same as the set (or possibly a subset [4]) of sequences used for the preamble. The two differences are that the power of each tone is boosted by +6dB over the unboosted data subcarrier power and the location of the relay amble is either dependent on the location of the R-DL zone or at the end of the subframe. This prevents a simple time domain correlator at the SS from selecting the relay amble over the frame start preamble as the candidate point for frame start and downlink channel selection during network entry.

Table 2 compares the power boosting difference between the various different data and pilot tone modulation types.

Table 2. Comparison of data and pilot tone boosting.
 Proposed text changes

[Insert a new subclause at the end of Section 8.4.6.1.1 as indicated:]

8.4.6.1.1.3 Relay amble

The MR-BS or RS may transmit a relay amble in the form of a relay zone preamble or relay postamble to facilitate identification of the MR-BS or RS by other RSs.

The subcarrier sets and the series used to modulate the relay amble pilots shall be the same as that defined for the frame start preamble in 8.4.6.1.1. The modulation used for the relay amble pilots is boosted BPSK as defined in 8.4.9.4.3.3.

[Insert new subclause 8.4.9.4.3.3:]

8.4.9.4.3.3 Relay amble modulation

The pilots in the relay zone amble on the R-DL shall follow the instructions in 8.4.6.1.1.3, and shall be modulated according to Equation (137a):

\[
\begin{align*}
\text{Re}(RA\_\text{PilotsModulated}) &= 4 \left( \frac{1}{2} - w_k \right) \\
\text{Im}(RA\_\text{PilotsModulated}) &= 0
\end{align*}
\]  

(137a)

References


