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Re:	In response to the LB#28 reply comments	
Abstract	This document provides proposed text for IEEE P802.16j on frame structure requirements and the definition of RSTTG and RSRTG	
Purpose	Discussion and adoption in the P802.16j draft	
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# On the issue of frame alignment and gaps for multihop relay transmissions

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## 1. Introduction

In order to provide support for the one radio RS operation as defined by 802.16j, new gaps (R-TTG and its related RSTTG, R-RTG and its related RSRTG) have been introduced, in order to avoid any data drops due to the Tx/Rx and Rx/Tx switching times.

This contribution provides some information on the specifications of these gaps based on the arrangement of the DL and UL subframe start time arrangement between the MR-BS and RSs.

This contribution is trying to supersede the following [IEEE 802.16-07/045r3](#) comments

- #48 (calculation formula of R-RTG)
- #51 (calculation formula of R-TTG)
- #28, #41 (definition of RSRTG)
- #29, #42 (definition of RSTTG)
- #879, #880, #881 (text in 8.4.4.2)
- #905 (text in 8.4.4.7.2.2)

## 2. Gaps in the relay frames

Figure 1 depicts MR-BS and RS frame structure with highlights of various gaps for information.

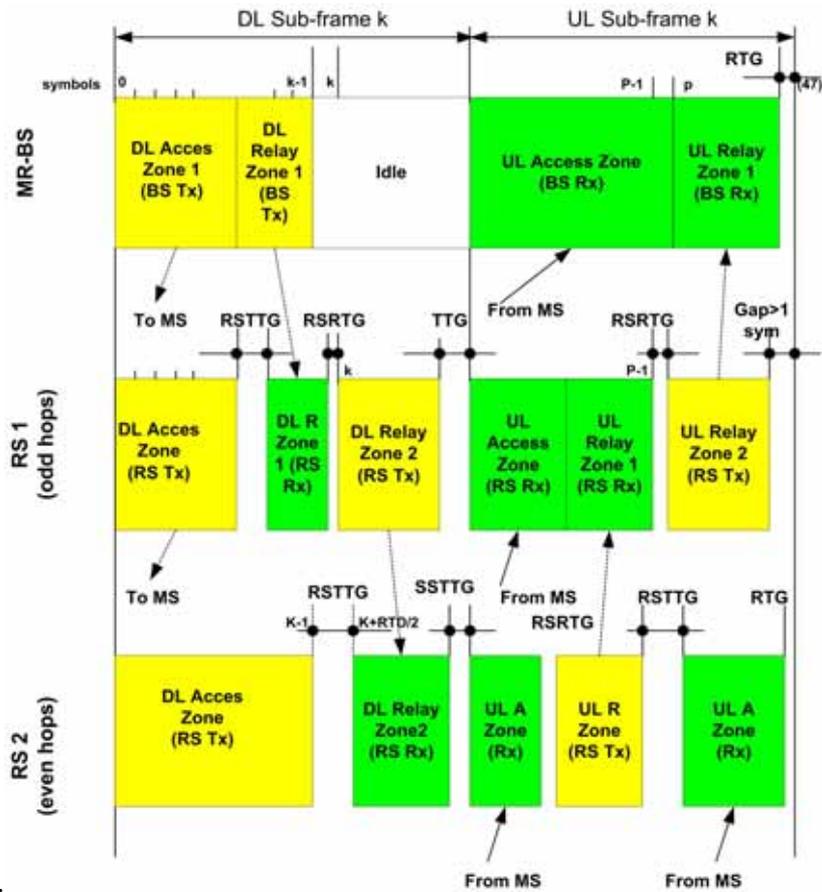


Figure 1 Frame structure (for informaion)

### 3. Already accepted comments

In #51 Malaga meeting, the following texts were already accepted by comment #27 and #43. This is for information.:

3.99 relay receive/transmit transition gap (R-RTG): RS receive/transmit transition gap between a received mode access zone or relay zone and a transmit mode access or relay zone in an RS frame that provides for the required RSRTG. It shall be an integer number of OFDM symbols. The R-RTG shall be calculated by following equation:

3.100 relay transmit/receive transition gap (R-TTG): RS transmit/receive transition gap between a transmit mode access or relay zone and a receive mode access or relay zone in an RS frame that provides for the required RSTTG. It shall be an integer number of OFDM symbols. The R-TTG shall be calculated by following equation:

## 4. Specific text changes

Change the text of the Definitions in the chapter 3, as follows:

**3.97 RS receive/transmit transition gap (RSRTG):** A gap within DL subframe or UL subframe between the last sample of the uplink receiving burst ~~in the UL access zone~~ and the first sample of the subsequent uplink subsequent transmitting burst ~~in the UL relay zone~~ at the antenna port of the relay station (RS). ~~This gap allows to allow~~ time for the relay station (RS) to switch from receive to transmit mode.

**3.98 RS transmit/receive transition gap (RSTTG):** A gap within DL subframe or UL subframe between the last sample of the downlink transmitting burst ~~in the DL access zone~~ and the first sample of the subsequent downlink subsequent receiving burst ~~in the DL relay zone~~ at the antenna port of the relay station (RS). ~~This gap allows to allow~~ time for the relay station (RS) to switch from transmit to receive mode.

Replace the formula that calculates R-RTG in 3.99(The definition of R-RTG) as follows:

$R\text{-RTG} = \text{ceiling}((\text{RSRTG} + \text{RTD}/2)/T_s) * T_s$ , where  $T_s$  is the OFDMA symbol time (refer to subclause 8.4.2.4)

Replace the second line of right side of the formula in 3.100(The definition of R-TTG) as follows:

$\text{ceiling}((\text{RSTTG} - \text{RTD}/2)/T_s) * T_s$ , where  $T_s$  is the OFDMA symbol time (refer to subclause 8.4.2.4)

Change the text in sub-clause #8.4.4.2 as follows:

In ~~multihop relay MR~~ systems where relay links and access links ~~on consecutive hops~~ are time separated, ~~relay station RS~~ allowances shall be made for an RSRTG and for an RSTTG. ~~The relay station shall not transmit downlink information to a subordinate station later than RSTTG - RTD/2 before the beginning of a received }mode DL relay zone . The relay station shall not receive uplink information from a subordinate station later than RSRTG+RTD/2 before the beginning of a transmit mode UL relay zone.~~ The parameters minimum required length of RSRTG and RSTTG for a RS are capabilities provided by the RS to MR-BS upon request during RS network entry and shall meet the requirements set in 12.4.3.1.5 (see 11.8.3.1).

All DL transmissions shall be symbol aligned with the corresponding symbols at the MR-BS. All UL transmissions shall be time advanced such that they are symbol aligned at the receiving station with the corresponding symbols at the MR-BS.

When an RS is requested to switch from transmit to receive mode within the DL or UL subframe, information shall not be scheduled to be transmitted to this RS earlier than R-TTG after the RS's scheduled transmission.

When an RS is requested to switch from receive to transmit mode within the DL or UL subframe, information shall not be scheduled to be transmitted to this RS later than R-RTG before the RS's scheduled transmission.

Delete the text in 8.4.4.7.1.2 (Relay frame structure for transparent mode), as follows:

~~If the RS switches from transmission to reception mode, an R-TTG shall be inserted. If the RS switches from reception to transmission mode, an R-RTG shall be inserted.~~

*Change the text in 8.4.4.7.2.2 (Relay frame structure for non-transparent mode), as follows:*

An example of an RS frame structure is shown in Figure 270b .

The RS transmits its frame start preamble time aligned with its superordinate station's frame start preamble.

The UL sub-frame of the RS is aligned to the UL sub-frame of the MR-BS.

The DL sub-frame shall include at least one DL access zone and may include one or more relay zones. ~~An R-TTG may be placed between a DL access zone and a DL relay zone and an R-TTG or R-RTG may be placed between two adjacent DL relay zones.~~

The UL sub-frame may include one or more UL access zones and one or more relay zones. ~~An R-RTG may be placed between a UL access zone and a UL relay zone and an R-TTG or R-RTG may be inserted between two adjacent UL relay zones.~~

A relay zone may be utilized for either transmission, reception, or idle but the RS shall not be required to support both modes of operation within the same zone.

~~If the relay station switches from transmission to reception mode, an R-TTG may be required. If the relay station switches from reception to transmission mode, an R-RTG may be required. There may be more than one R-TTG and more than one R-RTG inserted in the RS frame.~~ In each frame, the TTG shall be inserted between the DL sub-frame and the UL sub-frame. The RTG shall be inserted at the end of each frame.

The contents of the FCH, DL-MAP and UL-MAP in the Relay Frame may be different from those in the MR-BS frame.

Each RS frame begins with a preamble followed by an FCH and the DL-MAP and possibly a UL-MAP. In the DL access zone, the subchannel allocation, the FCH transmission, and the FCH shall be as defined in Section 8.4.4.2.

The R-FCH and the R-DL-MAP shall be transmitted in the first DL Relay zone that is in Tx mode.

The MR-BS or RS shall transmit the RS-CD message in the access zone for the subordinate RSs to configure the multihop relay frame structure through initial network entry or shall transmit the RS-CD message in the DL relay zone, when the frame configuration is changed through normal relay operation.

For synchronization purpose, the relay amble, when present, shall be located either at the end of the last DL relay zone in which MR-BS/RS is in transmit mode or at the end of the DL subframe. For monitoring purpose, the relay link amble, when present, shall be located at the end of the DL subframe. ~~An R-TTG or RRTG may be inserted before relay amble.~~