

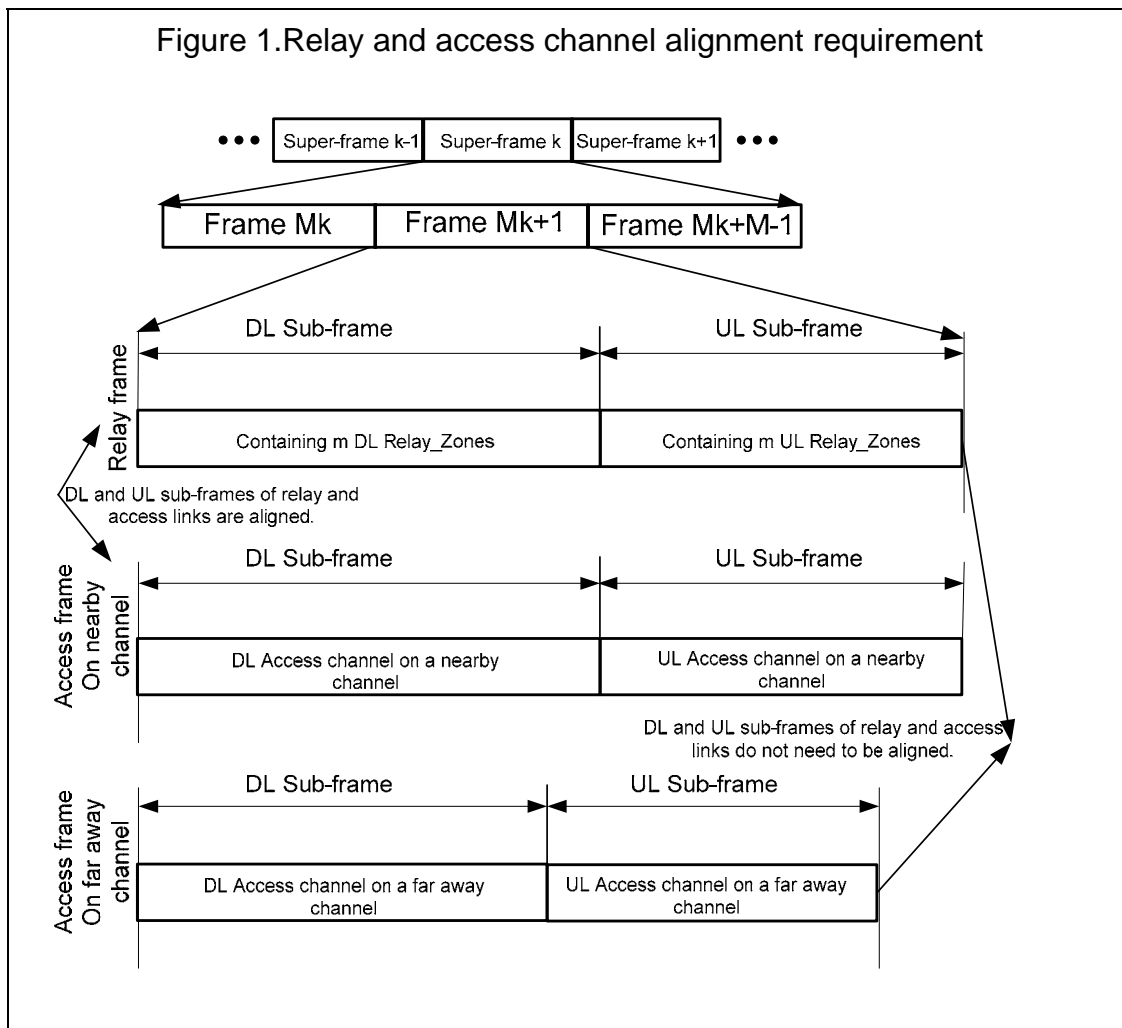
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Title	Frame Structure to Support Out-of-Band Relay	
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Re:	This is a response to the call for proposals 80216j-06_034.pdf.	
Abstract	This contribution propose a frame structure to support out-of-band multi-hop (≥ 2 hop) relay operation.	
Purpose	Text proposal for 802.16j Baseline Document.	
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Frame Structure Support Out-of-Band Relay

1 Introduction

The frame structure proposal accepted into the working document in the Dallas meeting addresses the case of in-band relay for two hop only networks. It provides a good basis for the frame structure required to support in-band and out-of-band multi-hop relay.

This contribution proposes the additional constructs required to support out-of-band relay. We define out-of-band relay to be the case where access links and relay links operate on different frequencies (channels). In out-of-band relay, the relay link frame structure does not contain access zones, because communication with the MSs occurs on a different channel. Similarly, there will be no relay zones on the access channel. However, for access and relay channels that are close together, the relay and access DL and UL sub-frames shall be aligned to avoid the strong transmit signal at the RS interfering the weak receive signal at the RS. See Figure 1 for details.



2 Proposed Solution

Two extensions are added to the super-frame structure currently specified in 80216j-06/026r1 in order to enable out-of-band operation. First the DL Relay_Zones need a relay preamble/postamble, which is used for DL acquisition and synchronization. Second, the frame start preamble, the DL Access_Zone and the UL Access Zone within each frame of the super-frame is removed.

2.1 Super-frame structure for out-of-band relay

The super-frame structure for out-of-band relay can be found in Figure 2 and Figure 3. A super-frame is defined to be a set of consecutive frames and the number of frames in a super frame is configurable. The number of Relay_Zones within a frame is configurable as well. The MR-BS and RSs can participate in 1 or more Relay_Zones to transmit and receive depending on the deployment scenarios and network assignments.

Each frame within a super-frame is divided into a DL Relay_Zone and a UL Relay_Zone. Each DL Relay_Zone is started with a relay preamble, followed by R-FCH and R-MAP as depicted in Figure 2. As an alternative, relay postambles inserted at the end of DL-subframe can be used instead of relay preambles as depicted in Figure 3. Each DL Relay_Zone begins with R-FCH, DL R-MAP and an optional UL R-MAP. At the end of the DL sub-frame, n postambles are transmitted. Ideally, $n = m$. However, for systems that want to reduce system overhead, MR-BS/parent RSs in different Relay_Zones can be grouped together and transmit the Relay postamble simultaneously. In this case, $n < m$. During a DL Relay_Zone of a frame within the super-frame structure, the MR-BS or parent RS transmits to its child RS. During a UL Relay_Zone of a frame within the super-frame structure, child RSs transmits to its parent RS or MR-BS who have transmitted to the child RSs in the earlier DL Relay_Zone of the same frame.

MR-BS or RS can participate in 1 or more Relay_Zone per super-frame. An RS can switch between being a parent RS and a child RS among the various frames within a super-frame. However, during each frame within the super-frame structure, an RS can be either a parent RS or a child RS but not both.

Figure 2.k-th super frame using relay preamble

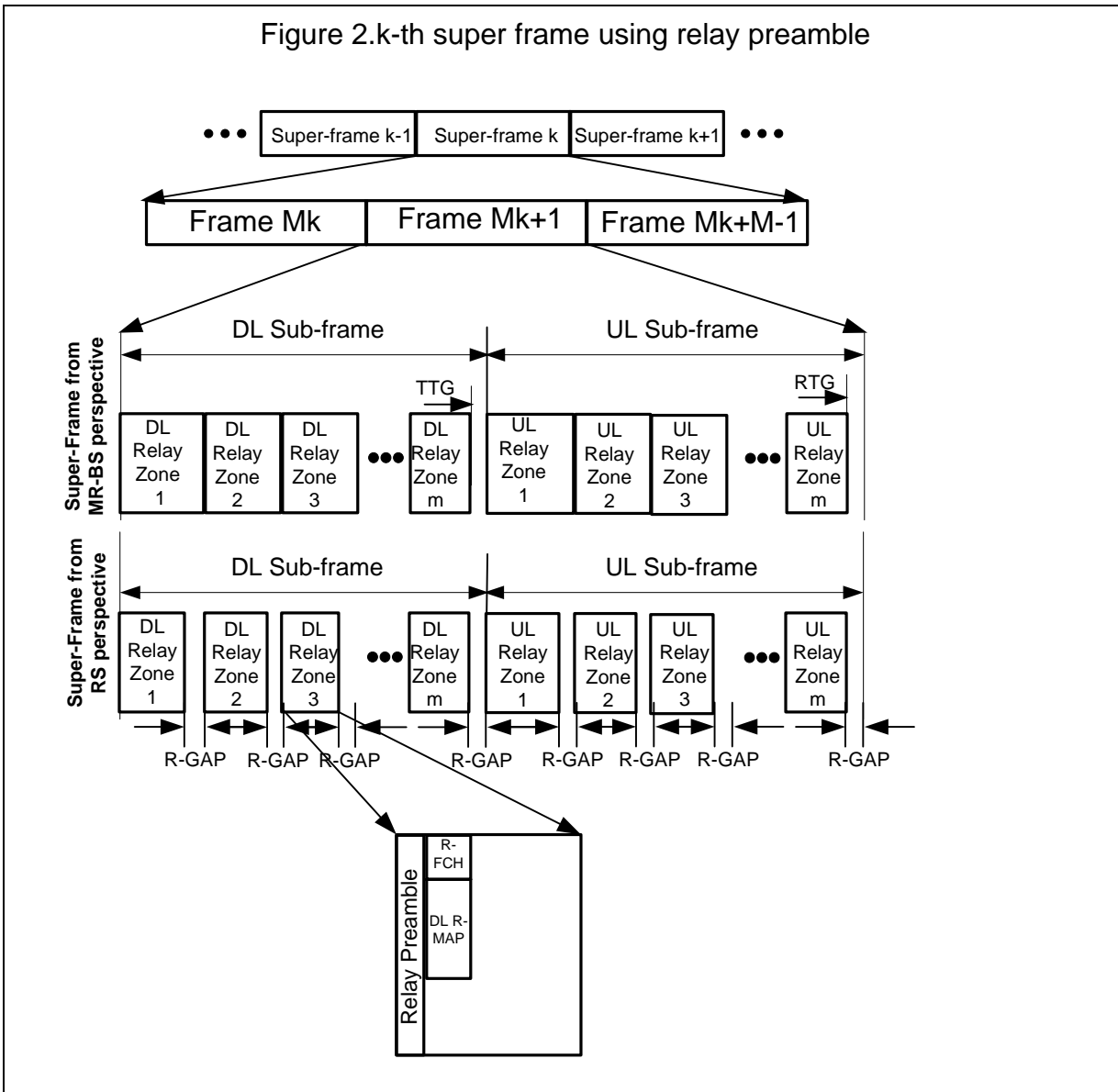
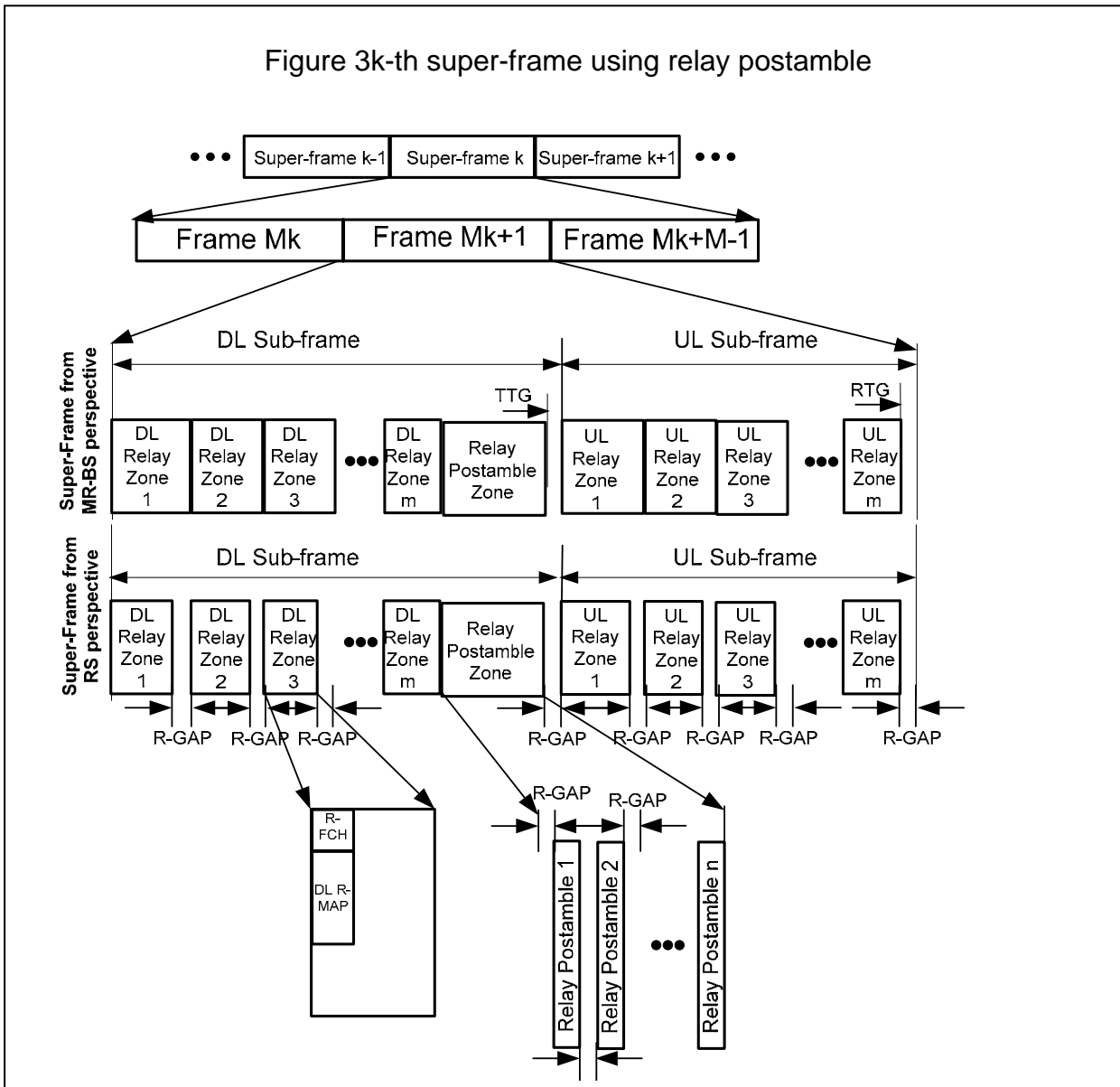


Figure 3k-th super-frame using relay postamble



3 Proposed text changes

+++++ start text proposal +++++

[Insert the following after the end of section 3:]

In-band Relay: a relay mode in which a single frequency channel is used to support both access link and relay link communication. Descriptions in 8.4.4.7.2.1 to 8.4.4.7.2.3 refer to in-band relay.

Out-of-band Relay: a relay mode in which access link and relay link communications occur on different frequency channels.

[Insert section 8.4.4.7.2.4 at the end of section 8.4.4.7.2.3]

8.4.4.7.2.4 Super-frame structure to support out-of-band multi-hop relay (≥ 2 hops)

The super-frame structure for out-of-band relay can be found in Figure xxx and Figure yyy. A super-frame is defined to be a set of consecutive frames and the number of frames in a super-frame is configurable. The number of Relay_Zones within a frame is configurable as well. The MR-BS and RSs can participate in 1 or more Relay_Zones to transmit and receive depending on the deployment scenarios and network assignments. An RS can switch between being a parent RS and a child RS among the frames within a super-frame. However, during each frame within the super-frame structure, an RS can be either a parent RS or a child RS but not both.

The DL Relay_Zone within each MR-BS super-frame starts with a relay preamble, followed by R-FCH, R-MAP as depicted in Figure xxx. As an alternative, relay postambles inserted at the end of DL-subframe can be used instead of relay preambles as depicted in Figure yyy. In this case, each DL Relay_Zone begins with R-FCH, DL R-MAP and an optional UL R-MAP. At the end of the DL-Subframe, the MR-BS may transmit relay postamble in the assigned time slot to aid synchronization. During a DL Relay_Zone of a frame within the MR-BS super-frame structure, the MR-BS transmits to its child RSs. During a UL Relay_Zone of a frame within the MR-BS super-frame structure, child RSs transmits to the MR-BS who has transmitted to the child RSs in the earlier DL Relay_Zone of the same frame within the MR-BS super-frame structure.

A TTG shall be inserted between each DL Relay_Zone and UL Relay_Zone within each frame in the MR-BS super-frame. A RTG shall be inserted at the end of each frame in the MR-BS super-frame.

The DL Relay_Zone within each RS super-frame starts with a relay preamble, followed by R-FCH, R-MAP as depicted in Figure xxx. As an alternative, relay postambles inserted at the end of DL-subframe can be used instead of relay preambles as depicted in Figure yyy. In this case, each DL Relay_Zone begins with R-FCH, DL R-MAP and an optional UL R-MAP. At the end of the DL-Subframe, the parent RS may transmit relay postamble in the assigned time slot to aid synchronization. During a DL Relay_Zone of a frame within the RS super-frame structure, a parent RS transmits to its child RSs. During a UL Relay_Zone of a frame within the

RS super-frame structure, child RSs transmits to its parent RS who have transmitted to the child RSs in the earlier DL Relay_Zone of the same frame within the RS super-frame structure.

An R-GAP shall be inserted between each DL Relay_Zone and UL Relay_Zone and between each frame within the RS super-frame structure.

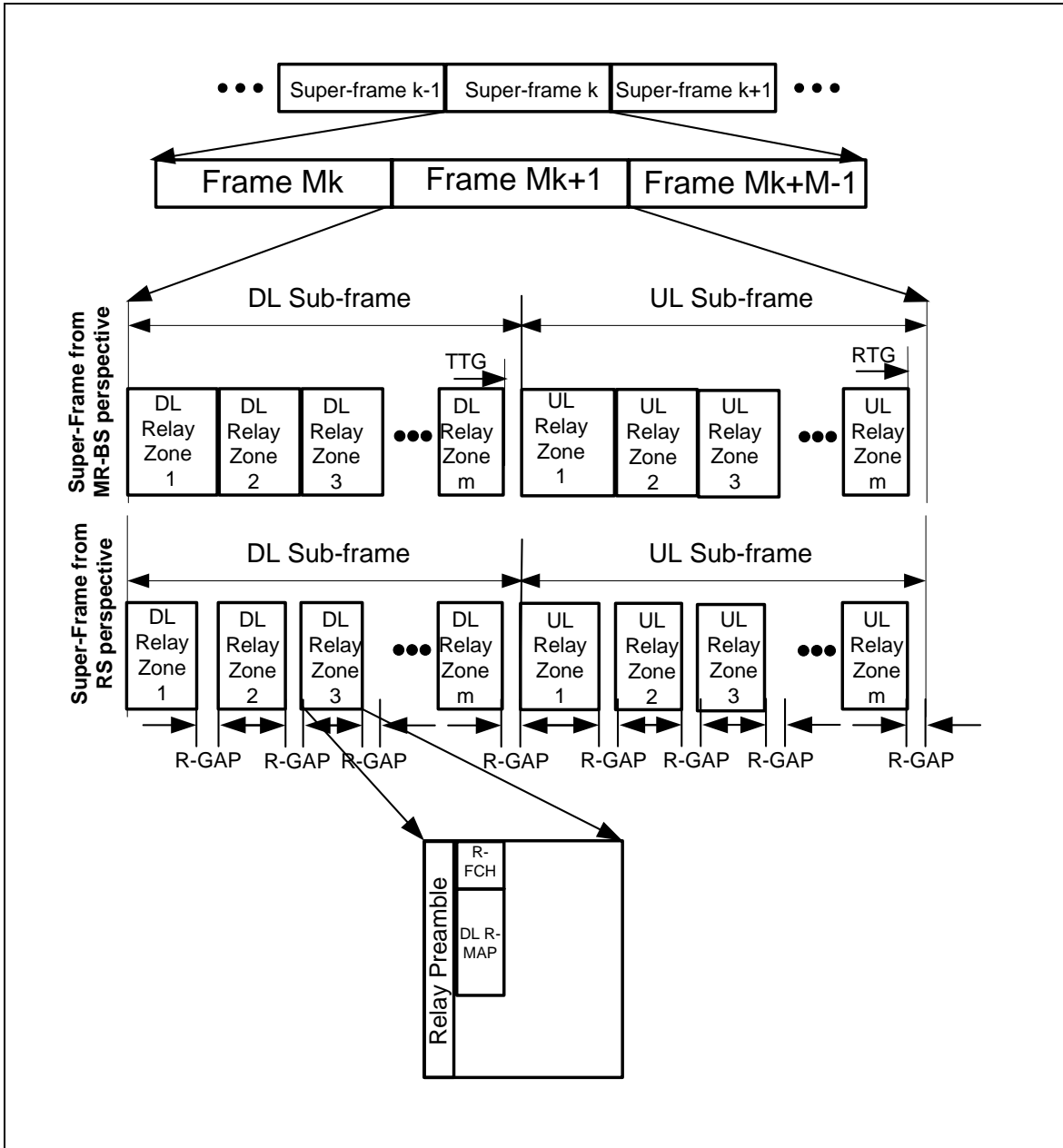


Figure xxx Example of M frame MR-BS and RS Super-Frame k for out-of-band relay using relay preamble

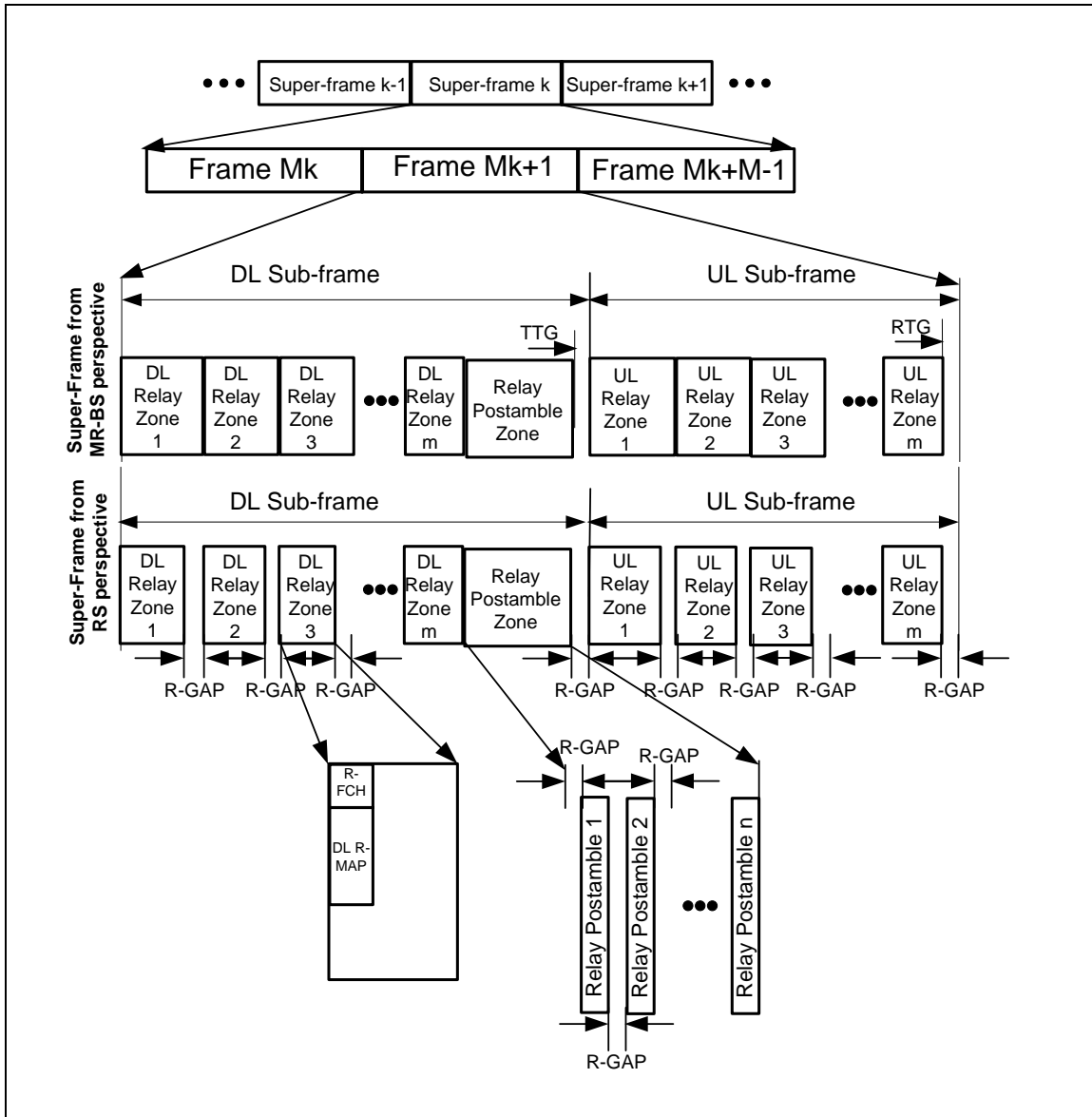


Figure yyy Example of M frame MR-BS and RS Super-Frame k for out-of-band relay using relay postamble

++++ End of text proposal +++++