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Title	**UL TDD HARQ Timing (16.2.14.2.2.2.2)**
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Source(s)	Mark Cudak mark.cudak@motorola.com **Motorola**
Re:	Category: P802.16m/D3 comments for LB30b Area: Chapter 16.2.14.2.2.2.2
Abstract	Subclause 16.2.14.2.2.2.2 on UL TDD HARQ Timing distributes the definition of the HARQ timing as a confusing mix of formulas, tables and prose. In addition, there are erroneous definitions including ellipses that are not rigorously defined. This contribution clarifies the definition of the HARQ timing with a minimal change to the variables.
Purpose	To be discussed and adopted by TGm for the 802.16m Amendment.
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UL TDD HARQ Timing (16.2.14.2.2.2.2)

Mark Cudak
Motorola Inc

1. Introduction

Subclause 16.2.14.2.2.2.2 on UL TDD HARQ Timing distributes the definition of the HARQ timing as a confusing mix of formulas, tables and prose. In addition, several of the variable references are ambiguously defined. For example, the values “D” and “U” are used within the equations but were defined several sections earlier. Moreover, “D” and “U” are used in later subclause as part of the frame configuration table. The values in the frame configuration table appear to be the appropriate values for these equations but that is not obvious. Unlike the downlink, there are flaws in the timing definitions were ellipses are used within the equation without any corresponding definitions.

This contribution clarifies the definition of the HARQ timing with a minimal change to the variables. The ellipses have been simply deleted.

2. Proposed Text Changes in P802.16m/D3

[Remedy 1: Replace lines 58 on page 233 through line 4 on page 235 with the following]

UL HARQ subpacket transmission corresponding to a UL Basic Assignment A-MAP IE in *l-th* DL AAI subframe of the *i-th* frame shall begin in the *m-th* UL AAI subframe of the *j-th* frame. A HARQ feedback time for the HARQ subpacket shall be transmitted in the *l-th* DL AAI subframe of the *k-th* frame. When the UL HARQ feedback indicates a negative acknowledgement, retransmission of the UL HARQ subpacket shall begin in the *m-th* UL AAI subframe of the p-th frame. The AAI subframe index *m, n* and frame index *j, k, p* shall be calculated as shown in Table 753

Table 753 –TDD UL HARQ timing

Content	Subframe index	Frame index
Basic Assignment A-MAP IE Tx in DL	l	i
HARQ Subpacket Tx in UL	For $D \geq U$, $m = \begin{cases} 0, & \text{for } N_{TTI} = U \\ l-K, & \text{for } K \leq l < U+K, N_{TTI}=1 \\ U-1, & \text{for } U+K \leq l < D, N_{TTI}=1 \end{cases}$ where $K = floor((D-U)/2)$	$j = (i+v) \bmod 4$ where $v = \begin{cases} 0, & \text{if}((D-l-1+m) \geq T_{proc}) \\ 1, & \text{else} \end{cases}$
	For $D < U$, $m = \begin{cases} 0, & \text{for } N_{TTI} = U \\ l-K, & \text{for } 0 < l < D-1, N_{TTI}=1 \\ l-K, & \text{for } l = D-1, N_{TTI}=1 \end{cases}$ where $K = -ceil((U-D)/2)$	
HARQ feedback in DL	l	$k = (j+1+w) \bmod 4$ where $w = \begin{cases} 0, & \text{if}((U-m-N_{TTI}+l) \geq T_{proc}) \\ 1, & \text{else} \end{cases}$
HARQ Subpacket ReTx in UL	m	$p = (k+v) \bmod 4$ where $v = \begin{cases} 0, & \text{if}((D-l-1+m) \geq T_{proc}) \\ 1, & \text{else} \end{cases}$

Where:

D – is the number of downlink subframes as defined by the frame configuration table

U – is the number of uplink subframes as defined by the frame configuration table

l – is the reference to the DL subframe, starting from 0 for the first downlink subframe and numbering up to *D-1*, where the A-MAP is transmitted

m – is the reference to the UL subframe, starting from 0 for the first uplink subframe and numbering up to *U-1*, where HARQ subpacket begins its transmission

l – is the reference for the DL subframe, starting from 0 for the first downlink subframe and numbering up to *D-1*, where the HARQ acknowledgement is sent

N_{TTI} – is the number of AAI subframes which a HARQ subpacket spans; i.e., 1 for the default TTI and U for long TTI in TDD UL

T_{proc} – is the data burst processing time required by both the base station and mobile station. T_{proc} is measured in subframes