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Title	Time Interval for Common SYNC Symbol	
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Re:	Response to Sponsor Ballot on IEEE802.16e/D6 document	
Abstract	To enhance the Common SYNC Symbol to simplify mobile cell search	
Purpose	To incorporate the text changes proposed in this contribution into the 802.16e/D7 draft.	
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Time Interval for Common SYNC Symbol

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1 Introduction

In the current IEEE P802.16-REVe/D6-2004, the Common SYNC Symbol was introduced to simplify initial frame search. However it can not be used to speed up the cell searching for HO candidates in mobile environments. Periodically an MSS has to search and identify all the neighboring cell preambles (up to 20 in the neighboring list) to calculate their signal quality, only the one with higher quality can be considered as a HO candidate. Even though most of the times, the MSS will see the current serving BS remain the best, however the searching process continues. In each search, the computation power needed to identify all the neighboring preambles remains excessive, which can be reduced according to this contribution to improve the battery life of MSS.

2 Proposed Solution

The presence of common SYNC symbol is periodic on a fixed time interval base. The longest period for common SYNC symbol transmission is TBD (say up to 120ms). It is up to the service provider to choose a proper common SYNC symbol time interval in the network deployment.

The presence cycle of the common SYNC symbol $N_{\text{SYNC_PERIOD}}$ can be determined by the frame duration and common SYNC symbol periodicity in real time, as shown in Table 1. In addition, such a common SYNC symbol can be assigned in very frame. The overhead vs. common SYNC time interval is listed in Table 2.

Table 1. $N_{\text{SYNC_PERIOD}}$ Time Interval vs. Frame Length

Frame Duration	Common SYNC Time Interval						
	$/N_{\text{POSTAMBLE PERIOD}}$						
2.0 ms	4ms /2	8ms /4	8ms /4	20ms /10	40ms /20	60ms /30	120ms /60
2.5 ms	-	5ms /2	10ms /4	20ms /8	40ms /16	60ms /24	120ms /48
4.0 ms	-	8ms /2	8ms /2	16ms /4	40ms /10	56ms /14	120ms /30
5.0 ms	-	-	10ms /2	20ms /4	40ms /8	60ms /12	12ms /24
8.0 ms	-	-	-	16ms /2	32ms /4	48ms /6	112ms /14
10.0 ms	-	-	-	20ms /2	40ms /4	60ms /6	120ms /12
12.5 ms	-	-	-	-	25ms /2	50ms /4	100ms /8
20.0 ms	-	-	-	-	40ms /2	40ms /2	120ms /6

Table 2. DL subframe overhead vs. Common SYNC Symbol time

Frame Duration	4ms	8ms	10ms	20ms	40ms	60ms	120ms
DL Subframe Overhead with Single SYNC Symbol	<5%	<2.5%	<2%	<1%	<0.5%	<0.3%	<0.15%

DL Subframe Overhead with Dual SYNC Symbols	<10 %	<5%	<4%	<2%	<1%	<0.6 %	<0.3%
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3 Proposed Text

Example text changes with 7a option are provided below.

[Replace **Table 307e** [1] with following tables]

-----Start text -----

8.4.6.1.1.1 Common SYNC symbol (optional)

In every **fourth** $N_{\text{SYNC_PERIOD}}$ downlink transmission frame, ...

Starting from frame 0, the location of the Common SYNC Symbol can be determined by every $N_{\text{SYNC_PERIOD}}$ frames, as listed in Table 307g.

Table 307g— $N_{\text{SYNC_PERIOD}}$ Time Interval vs. Frame Length

Frame Duration	Common SYNC Time Interval						
	$/N_{\text{SYNC_PERIOD}}$						
2.0 ms	4ms /2	8ms /4	8ms /4	20ms /10	40ms /20	60ms /30	120ms /60
2.5 ms	-	5ms /2	10ms /4	20ms /8	40ms /16	60ms /24	120ms /48
4.0 ms	-	8ms /2	8ms /2	16ms /4	40ms /10	56ms /14	120ms /30
5.0 ms	-	-	10ms /2	20ms /4	40ms /8	60ms /12	12ms /24
8.0 ms	-	-	-	16ms /2	32ms /4	48ms /6	112ms /14
10.0 ms	-	-	-	20ms /2	40ms /4	60ms /6	120ms /12
12.5 ms	-	-	-	-	25ms /2	50ms /4	100ms /8
20.0 ms	-	-	-	-	40ms /2	40ms /2	120ms /6

-----End text -----

4 References

- [1] IEEE P802.16-REVe/D6-2004
- [2] IEEE P802.16-2004