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Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**GPS Assisted Initial Ranging in IEEE 802.16m**
Date Submitted	**2009-01-08**
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Re:	Contribution in response to TGm "Call for Comments on Project 802.16m SDD" for Session #59 (IEEE 802.16m-08/052), Section 11.9.2.4
Abstract	**Initial ranging in IEEE 802.16m using GPS information in the mobile station**
Purpose	To discuss and adopt the proposed text in the next revision of the 802.16m SDD
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GPS Assisted Initial Ranging in IEEE 802.16m

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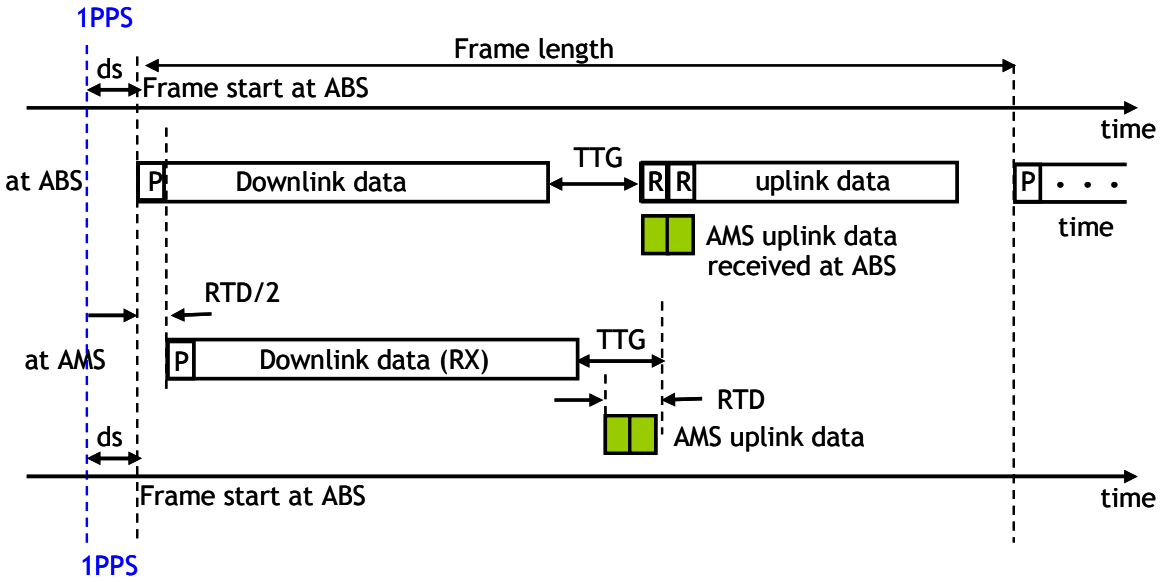
Introduction

In a multi cell environment it is recommended for the ABSs in chapter 22.1 to use the pulse per second timing signal (1PPS) from the GPS receiver to synchronize their operation, i.e. all the ABSs start to transmit the downlink frame at the same time and also the uplink frame start is common for all ABSs. According to 22.2 the frame starts at the ABS a programmable delay shift after the pulse per second (1PPS) provided by the GPS receiver.
When the AMS is equipped with GPS capability, it can use the 1PPS timing signal from the GPS receiver and the delay shift value (ds), which shall be broadcasted to the AMSs in units of micro-seconds, to generate the same frame start signal as it is done by the ABS as shown in Figure 1.
When AMS receives the downlink frame start it can measure the delay between the frame start at ABS and the received frame start and can calculate the transmission delay between ABS and AMS - which roughly is half of the round trip delay (RTD) when assuming that the downlink transmit delay is equal to uplink transmit delay. With the knowledge of the RTD the AMS can calculate how to adjust the uplink transmit start to arrive at the ABS in time .
With this mechanism parts of the initial ranging procedure can be skipped, which means that no, or at least a reduced number of initial ranging opportunities have to be provided in the uplink frame and the saved frame resources (especially when supporting large cell size with huge guard time (GT)) can be used for traffic data instead and thus the uplink throughput can be increased. Additionally the time duration of the complete ranging process is reduced.



ds: delay shift according §22.2

1PPS: Pulse per Second, provided by GPS receiver

TTG: transmit/receive transition gap

Figure 1: Frame timing TDD

Proposed text for SDD for Initial Ranging

Insert the following text into IEEE 802.16m-08/003r6 at page 108, line 34

----------Start of the Text----------

11.9.2.4 Ranging Channel

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When an AMS is equipped with GPS capability, it can use assistance of locally available GPS information to determine the transmission delay for the first UL transmission and skip the first part of the initial ranging process which uses a completely unsynchronized UL transmission. Thus, the initial ranging procedure can be shortened and the radio resource usage for initial ranging can be reduced.

----------End of the Text----------