Project	**IEEE 802.20 Working Group on Mobile Broadband Wireless Access** <**http://grouper.ieee.org/groups/802/20/**>
Title	**Requirement for Synchronization**
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Abstract	This document describes the key factor of the 802.20 Requirement Document and related rationale.
Purpose	Discussion and adopt
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1. Purpose

This document remarks key requirement for MBWA system implementing the IEEE 802.20 standard.

2. Scope

The requirement which this document defines reflects the necessary demand relating to the mobile communication systems which need synchronization.

3. Requirement

Section 4.2 PHY/RF

4.2.5 --- Synchronization

Proposed text

The 802.20 air interface specification shall support the synchronization technology. Downlink synchronization and the uplink synchronization shall be mandatory, while the Base Station synchronization should be optional.

Rationale

Synchronization is an important concept in any wireless communication system including IEEE 802.20. Proper synchronization contributes to the orthogonality of the users and to avoiding the interference, which is essential for reliable transmission. The synchronization can be mainly divided into inter-Base Stations, downlink direction and uplink direction.

1. Inter-Base Stations Synchronization

A mobile communication system which has the characteristic of neighboring Base Stations synchronization will have more predominance than those not having the speciality. When the Base Station synchronization founded, it will benefit the user handoff between neighboring base stations.

2. Downlink Synchronization

When on initialization or after signal loss, powering on, the mobile terminal shall acquire a downlink channel. If this succeeds, it is called that PHY has achieved synchronization, as given a PHY indication, the MAC sub layer shall attempt to acquire the channel control parameters for the downlink and then the uplink.

3. Uplink Synchronization

It can be partitioned two types of scenarios. One is of initialization uplink synchronization and the other is of uplink synchronization maintenance. On initialization or after signal loss and after downlink synchronization, the uplink synchronization is initiated, which is related to the random access procedure etc. The synchronization maintenance is also a key factor to the orthogonality of the users' uplink signals and to avoid the interference between them.

For Example
In multi-user OFDM, the orthogonality of the sub-carriers facilitates a sub-carrier division of different users, where one OFDM symbol contains many users. In the uplink of such systems, users must be aligned in time and frequency to maintain the orthogonality of the sub-carriers.
In TDD-based technology, users who occupy the different time slots should have precise uplink synchronization with the Base Station or it will cause much interference for the BS in modulating users' signals correctly.