

# Proposal for Preamble Design

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Re:

IEEE 802.16m-08/016r1: Call for Contributions on Project 802.16m System Description Document (SDD), **Preambles**.

Abstract:

To propose preamble design robust to frequency-selectivity but taking advantage of frequency-diversity in IEEE 802.16m systems

Purpose:

For discussion and approval in TGm.

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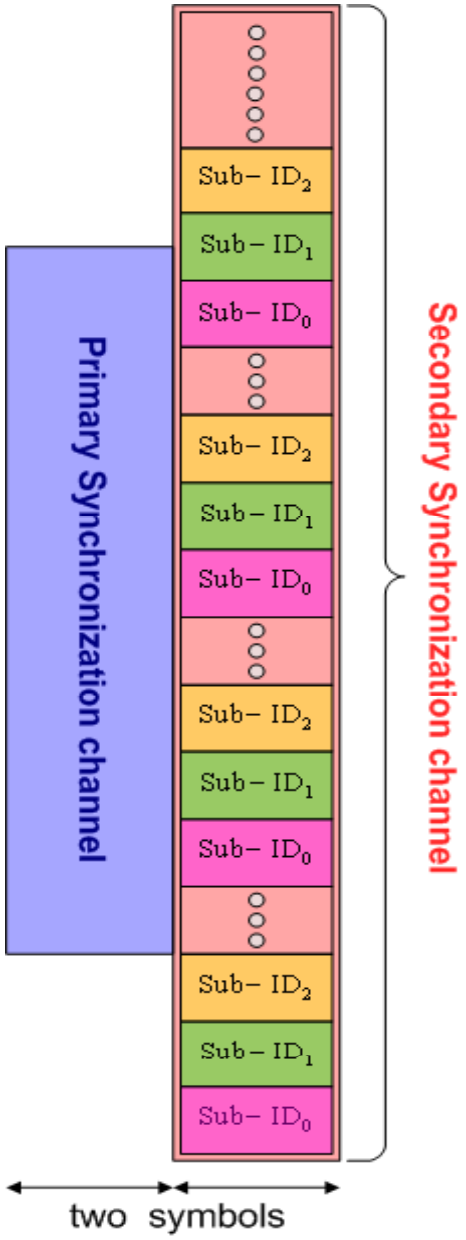
<<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <<http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

Further information is located at <<http://standards.ieee.org/board/pat/pat-material.html>> and <<http://standards.ieee.org/board/pat>>.

# Roles of Preamble (Synchronization Channel)

- Synchronization channel =
  - Primary Synchronization channel
  - + Secondary Synchronization channel
- Primary Synchronization channel is used for
  - Frame timing synchronization,
  - Frequency synchronization.
- Secondary Synchronization channel is used for
  - Cell ID search,
  - Band-specific channel quality measurement.

# Structure of Synchronization Channels



**Fig. 1** Structure of synchronization channels

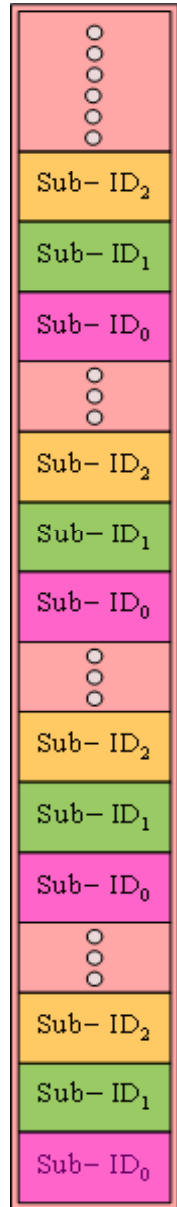
# Primary Synchronization Channel

- All cells use the same pattern of Primary Synchronization channel.
- Primary Synchronization channel may occupy only a small part (not whole) of the minimum nominal channel bandwidth (i.e., 5 MHz).
  - since reducing the occupied bandwidth can mitigate the negative effect of frequency-selectivity on the synchronization performance.

# Secondary Synchronization Channel

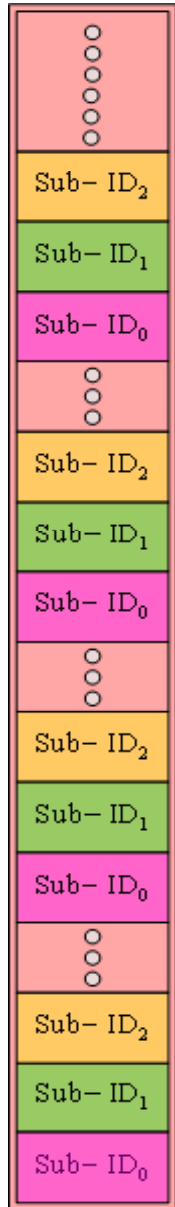
- Secondary synchronization channel will be detected by a non-coherent manner, since
  - channel estimation using the primary synchronization channel is not well-performing when signal of primary synchronization channel from other cells interferes; or
  - primary synchronization channel may not occupy the whole bandwidth which, on the other hand, is occupied by the Secondary Synchronization channel.

# Secondary Synchronization Channel (Cont'd)



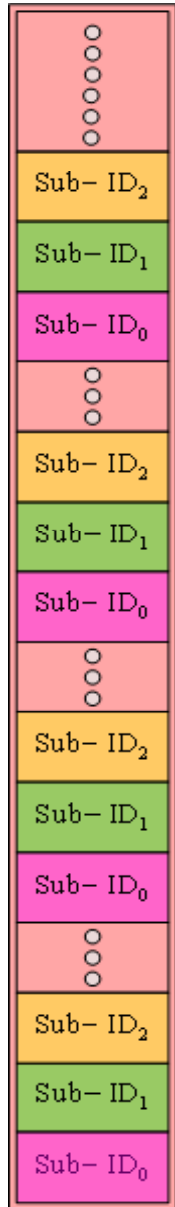
- A Secondary Synchronization channel is partitioned into many small sub-blocks in frequency domain.
  - which helps mitigate the negative effect of frequency-selectivity on correlation-based synchronization performance.
- Secondary Synchronization channels occupy the whole available bandwidth to
  - improve the synchronization performance;
  - enable band-specific channel quality measurement with preamble.

## Secondary Synchronization Channel (Cont'd)



- Each sub-block has a Sub-ID identified by a sequence whose length is the sub-block size.
- Each cell ID is specified by a combination of sub-IDs (Sub-ID<sub>0</sub>, Sub-ID<sub>1</sub>, Sub-ID<sub>2</sub>, ...).
- Such combination makes it easy to obtain sufficient number of cell IDs.

## Secondary Synchronization Channel (Cont'd)

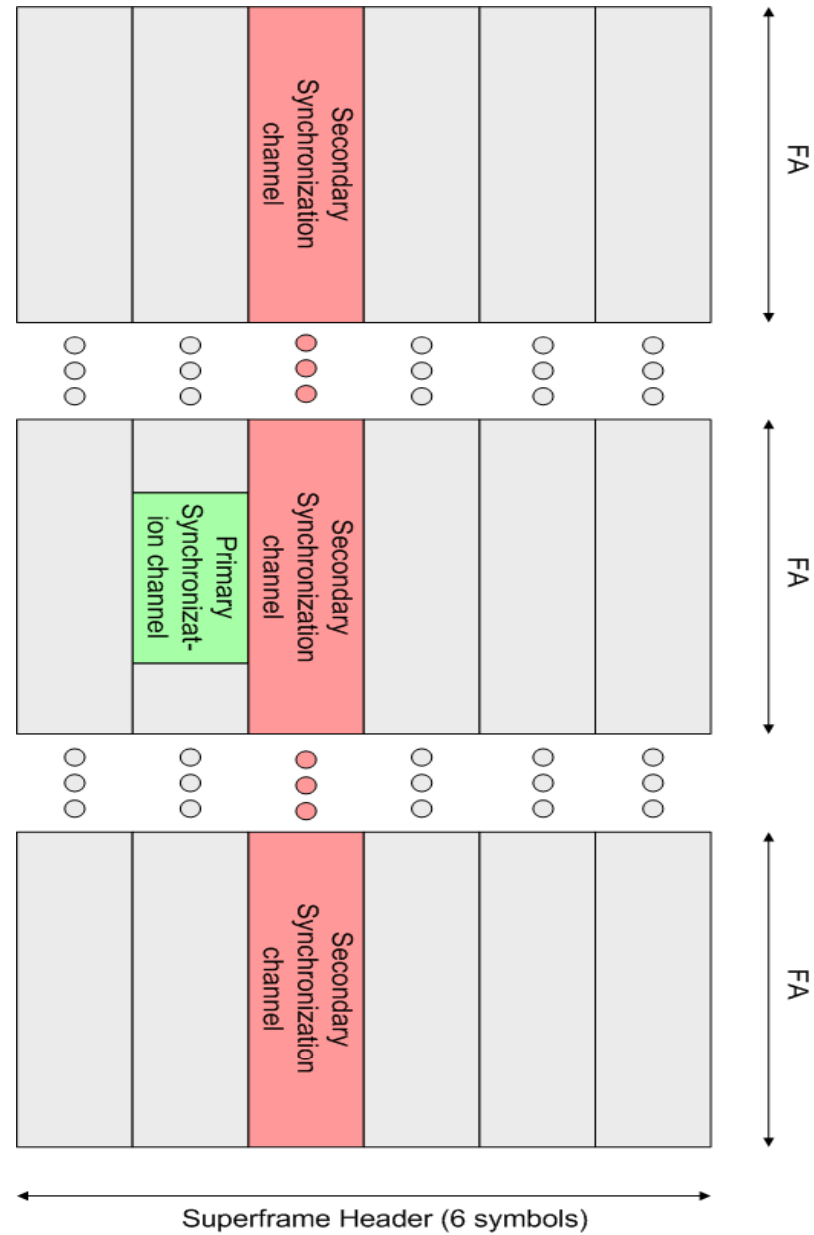


- Several different sub-blocks convey the same sub-ID information
  - To support for reliable detection of each sub-ID.
- Sub-blocks of the same sub-ID are distributed
  - to take advantage of frequency diversity.





# For Multi-FA Operation



**Fig. 3** Structure of synchronization channels for multi-FA operation.

# Proposed Texts into SDD

## X.y Preamble (Synchronization Channels)

Synchronization channels (preamble) are comprised of a primary synchronization channel and a secondary synchronization channel as shown in Fig. 1. (*include Fig. 1*)

### X.y.1 Primary Synchronization Channel

- The same pattern of primary synchronization channel is used by all cells.
- .....

### X.y.2 Secondary Synchronization Channel

- A Secondary Synchronization channel is partitioned into many small sub-blocks in frequency domain. Each sub-block has a Sub-ID identified by a sequence whose length is the sub-block size. Each cell ID is specified by a combination of the sub-IDs.

## Proposed Texts into SDD (Cont'd)

- Several different sub-blocks convey the same sub-ID information and they are distributed to take advantage of frequency diversity for reliable detection of each sub-ID.
- Secondary synchronization channel sub-blocks are grouped into each band to enable band-specific channel quality measurement, as shown in Fig. 2. (*include Fig. 2*)

### X.y.3 For Multi-FA Operation

- Secondary synchronization channels are available in all FAs for improving synchronization performance and enabling band-specific channel quality measurement as shown in Fig. 3. (*include Fig. 3*)