Duplex and Multiplex Configurations for OFDMA In-Band Relay

Document Number:
C802.16mmr-05/011
Date Submitted:
2005-09-09
Source:
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Base Document: N/A
Purpose:
To present a single RF head in-band relay duplex and multiplex for IEEE802.16e OFDMA mode

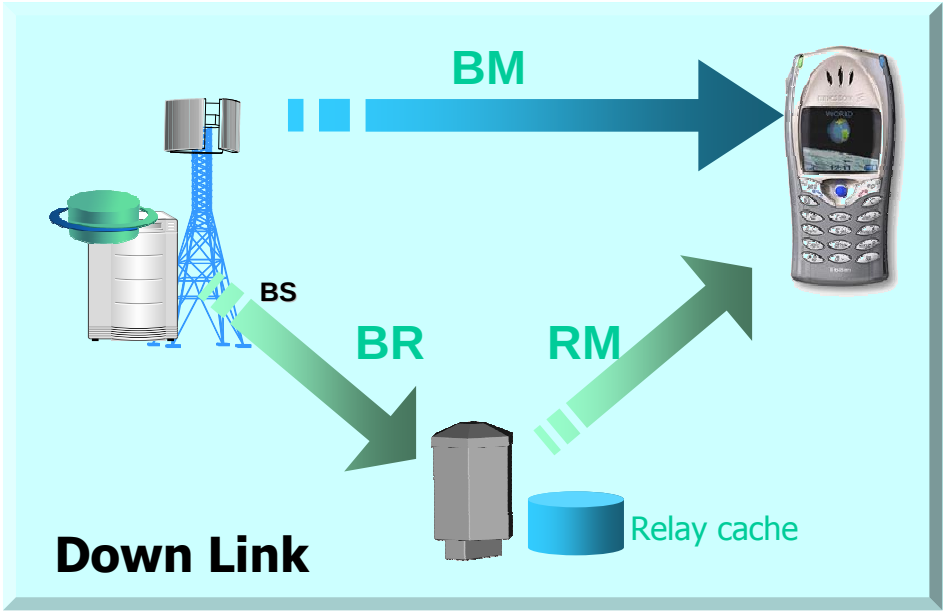
Background

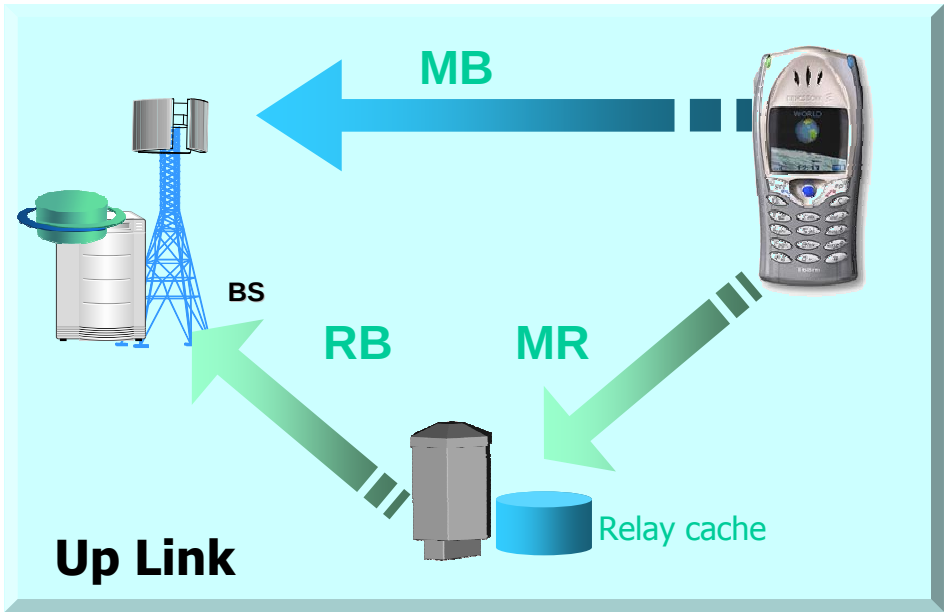
- The Meshed Wireless Network Vision
  - Introduce the relay function in the conventional cellular network
    - To allow to extend to multi-hop network topology
    - To allow to extend to mesh network topology
- To enable multi-hop and/or mesh network
  - Require new duplex RF architecture for
    - FDD and TDD arrangement
  - Require new multi-user multiplex scheme to
    - Increase spectrum efficiency and reduce interference
- Analogy relay
  - External band relay
    - **Dual RF transceiver chains (**Double Cost!)
  - In-band relay
    - Noise enhancement and feedback isolation
- Digital relay
  - External band relay
    - **Dual RF transceiver chains (**Double Cost!)
  - TDD in-band relay
  - FDD Solution with Conventional FDD RF Head

This contribution aims to present the possible duplex/multiplex configurations in the IEEE802.16 OFDMA context

New Networking Modes and Topologies

(Fixed Relay Station)

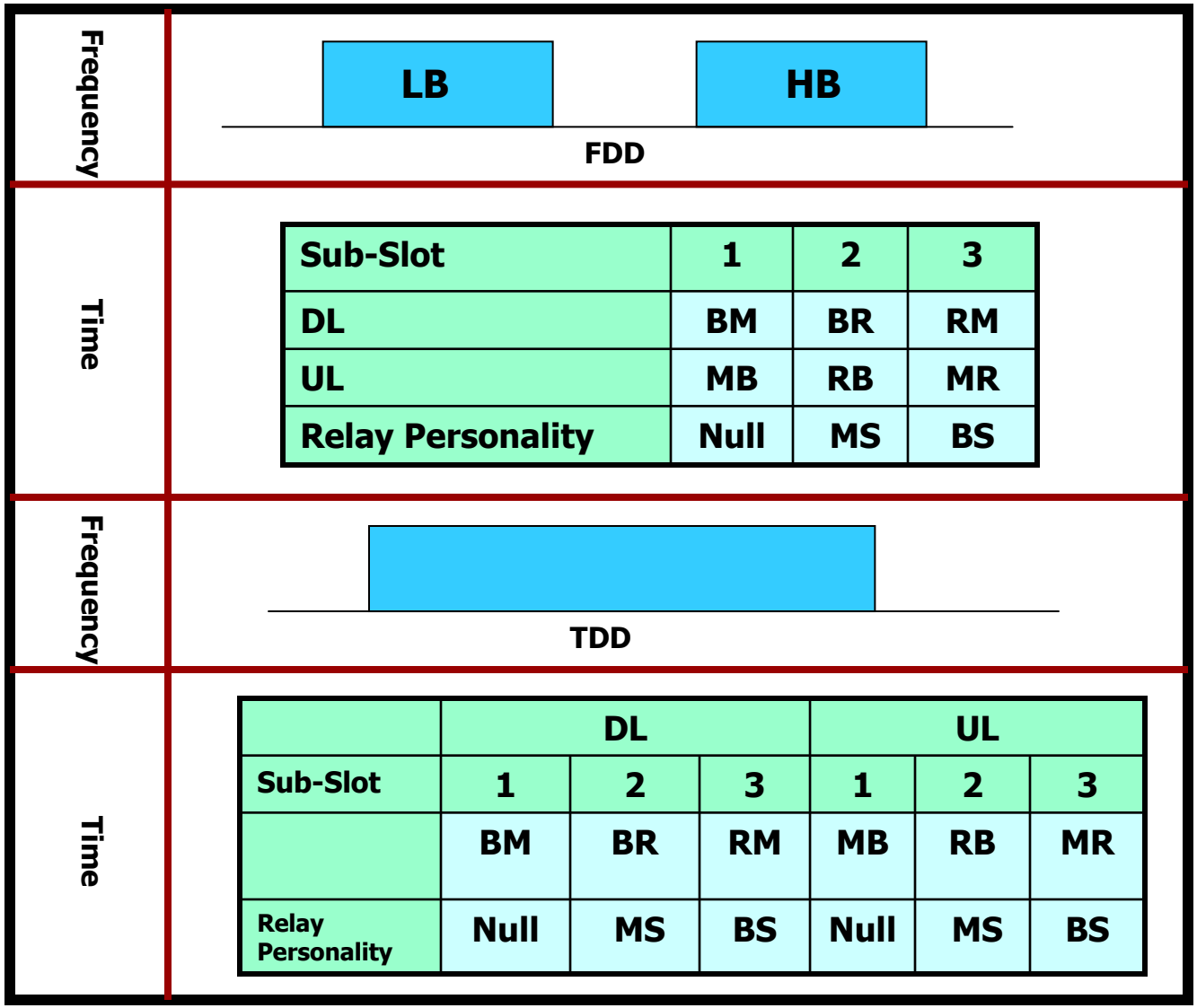




- **Down link direction**
  - BS to MS (BM)
  - BS to FRS (BR)
  - FRS to MS (RM)

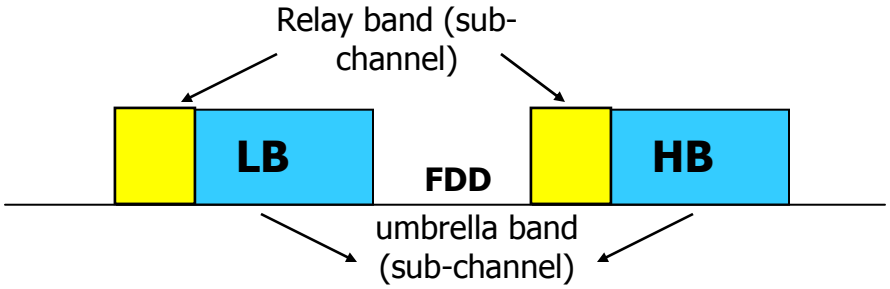
- **Up link direction**
  - MS to BS (MB)
  - MS to FRS (MR)
  - FRS to BS (RB)

In-Band OFDM/TDM Relay Mode



In-Band OFDMA/TDM Relay FDD Mode

Frequency

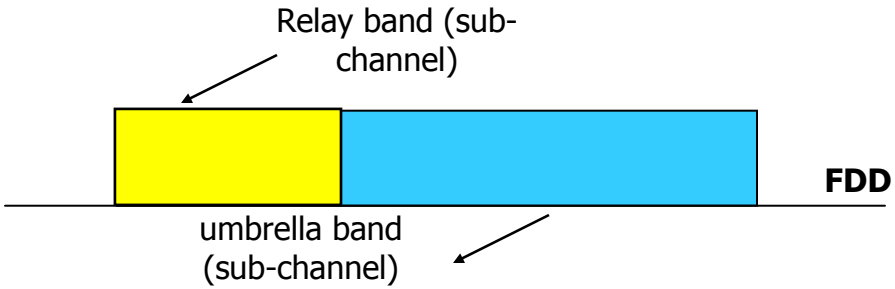


Time

Sub-Slot		1	2
DL	Umbrella Band	BM	
	Relay Band	BR	RM
UL	Umbrella Band	MB	
	Relay Band	RB	MR
Relay Personality		MS	BS

In-Band OFDMA/TDM Relay TDD Mode

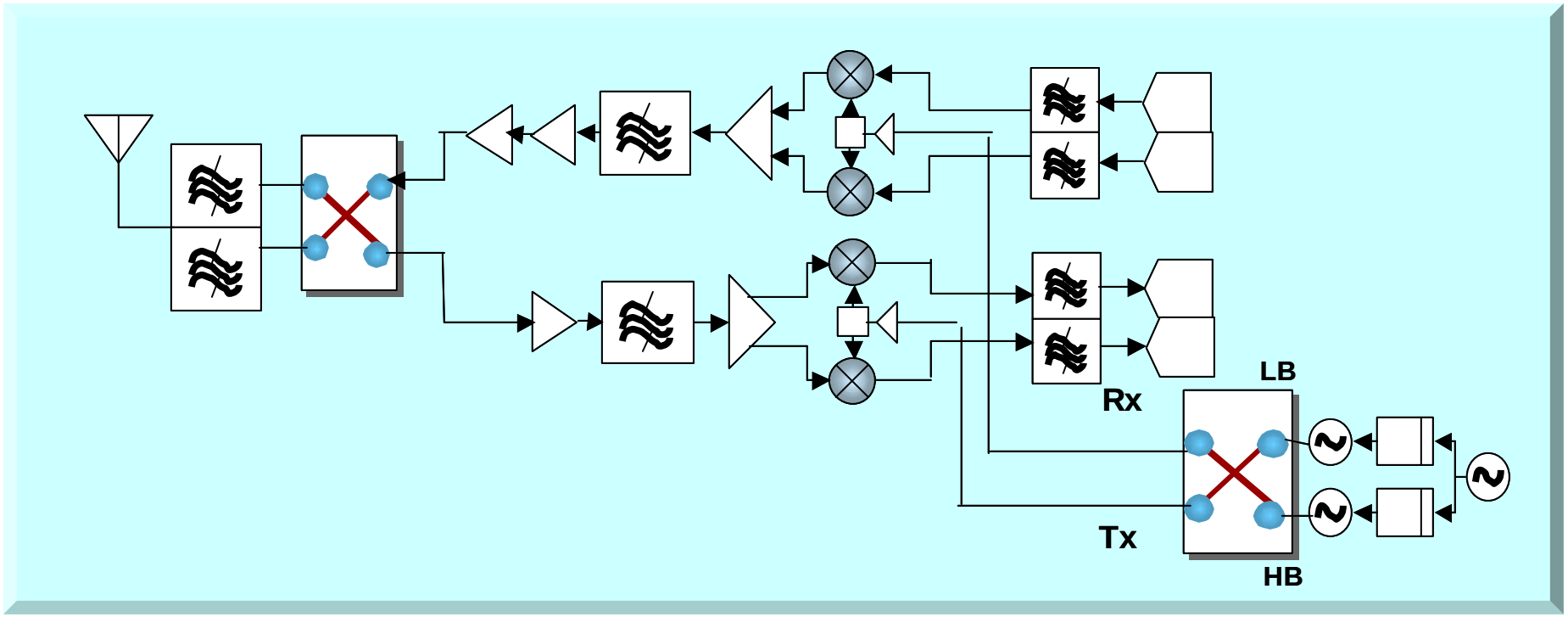
Frequency



Time

		DL		UL	
Sub-Slot		**1**	**2**	**1**	**2**
DL	**Umbrella Band**	**BM**		**MB**	
	Relay Band	**BR**	**RM**	**RB**	**MR**
Relay Personality		**MS**	**BS**	**MS**	**BS**

Relay Node Zero-IF Architecture with Variable Duplexer or Switched Duplexer



A single transceiver with switch matrix for Relay Node reduces the cost

Summary and Applications

- An OFDMA/TDM hybrid relay multiplex and duplex arrangement is presented
  - The relay performance can be optimized by
    - Allocation of relay band (relay sub-channels)
    - Allocation of relay slot
- Relay node architecture with variable duplexer and switched RF synthesizer enable FDD Relay
- Relay-node link configuration can be paired with spectrum allocation for relay band
  - The configuration can be combined with TDM and OFDMA operation
  - The configuration can be combined with TDD and OFDMA operation
- To keep the relay node RF chain simple, only one configuration per node is allowed for a given time slot