Cooperative diversity in relay downlink

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Introduction

- General relay transmission using exclusive time-frequency resources
- How can we efficiently use resources?

Fig. 1. Example of general relay transmission
Introduction

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• How can we efficiently use resources?

Fig. 1. Example of general relay transmission
Cooperative Relaying in R-DL

• Cooperative source diversity
  – Multiple sources with the same signals

• Cooperative transmit diversity
  – Multiple sources with STC-coded signals

• Cooperative hybrid diversity
  – Combination of source and transmit diversity
Cooperative source diversity

• Legacy SS/MS: no STBC support req’d

• Proposed method
  – Diversity gain using multiple signal sources
  – Simultaneous transmission in one or multiple RS & BS using the same media & data
  – No additional functionality for MS

• Requirement:
  – Timing difference between sources < CP duration
Cooperative source diversity (cont.)

• Example

(a) Usage of BS & RS

(b) Usage of multiple RSs
Cooperative source diversity (cont.)

• Example

(c) Usage of BS & multiple RSs

Fig. 2. Examples of cooperative source diversity
Cooperative transmit diversity

• For SS/MS having STBC decoder

• Proposed method
  – Transmit diversity using multiple signal source
  – Usage of different STC encoding in each signal source
  – Two choices: No processing at RS or Low processing at RS

• Requirement :
  – Timing difference between sources < CP duration
Cooperative transmit diversity (cont.)

• Example

(a) Usage of the different STC encoded BS & RS
Cooperative transmit diversity (cont.)

• Example

Fig. 3. Examples of cooperative source diversity
Cooperative hybrid diversity

- Combination of source & transmit diversity
- Example

Fig. 4. Example of the same STC encoded sources of BS & a RS and another STC encoded source of RS
Example with STBC for 4 Tx

RS1

a, -b, 0, 0

b, a, 0, 0

0, 0, c, -d

0, 0, d, c

RS2

MS