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Re:	This is in response for call for comments P802.16j/D1
Abstract	Clarification on Cooperative Relaying
Purpose	Review and adopt
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Clarification on Cooperative Relaying

NSN, Samsung Thales, ETRI

Introduction

This contribution is a response to comments regarding cooperative relaying (306, 977, 978, 979). Some changes build on top of 545r3 (accepted in batch resolution). Other changes in this contribution deal with clarification in Section 8.4.8.10 as well as introduce capabilities negotiation.

Specific changes

[Change the following unlabelled table in Section 11.23.6 introduced in 545r3 (page 11)]
[Note to editors: This change is applied to changes made in 545r3.]

Syntax	size	note
Zone Configuration IE _Format() {	-	-
Zone Configuration bitmap	8 bits	b0=1, permutation based included b1=1, range of subchannels included b2=1, STC mode b3=1, Cooperative diversity configuration included~~mode~~ b4=1, AMC mode b5=1, Safety/PAR reduction mode b6-b7: reserved
if (b0 of Zone Configuration bitmap ==1) {		
Permutation based	6 bits	DL_PermBase or UL_PermBase to be used in this zone
Reserved	2 bits	
}	-	-
if (b1 of Zone Configuration bitmap ==1) {	-	-
if (The IE is in DL-subframe configuration) {		
Used subchannel bitmap	6 bits	bit #0, Subchannel group 0 bit #1, Subchannel group 1 bit #2, Subchannel group 2 bit #3, Subchannel group 3 bit #4, Subchannel group 4 bit #5, Subchannel group 5
reserved	2 bits	Shall be zero
}		
if (The IE is in UL-subframe configuration) {		
Min Subchannel index	8 bits	The index of subchannel from which the allocation starts.
Max Subchannel index	8 bits	The index of subchannel at which the allocation ends.
}		
}	-	-
if (b2 of Zone Configuration bitmap ==1) {	-	-
STC mode	*TBA*	
}	-	-
if (b3 of Zone Configuration bitmap ==1) {	-	-
~~Cooperative diversity mode~~	*~~TBA~~*	
Enable_cooperative_diversity	1 bit	If set to 0, cooperative transmit/hybrid diversity is

		disabled.
if (Enable_cooperative_diversity ==1) {	-	-
Antenna assignment for cooperative diversity	4 bits	Bit#0: Antenna #0
		Bit#1: Antenna #1
		Bit#2: Antenna #2
		Bit#3: Antenna #3
}	-	-
Padding	*variable*	Padding to ensure byte aligned.
}	-	-
if (b4 of Zone Configuration bitmap ==1) {	-	-
AMC mode	*TBA*	
}	-	-
if (b5 of Zone Configuration bitmap ==1) {	-	-
Safety/PAR reduction mode	*TBA*	
}	-	-
}	-	-

Antenna assignment for cooperative diversity

Indicates which antenna the corresponding RS should play the role of. For example, if this field (Bit#0-#3) is a 0b1000, the relay station shall be playing the role of Antenna #0. As another example, in case the RS has two antennas and this field (Bit#0-#3) is 0b1100, two antennas of the RS shall take the roles of Antenna #0 and #1. Each antenna will transmit pilots based on the permutation number of antennas as indicated in STC mode and antenna assignment. The number of ones in the "Antenna assignment for cooperative diversity" field indicates the effective number of antennas being used for cooperative relaying.

[Change Section 8.4.8.10 as follows]

8.4.8.10 Cooperative Relaying

Cooperative relaying can be achieved within an MR-cell using either an MR-BS and one or more RSs or multiple RSs transmitting in cooperation. These RSs are either transparent or non-transparent transmitting the same frame start preamble, FCH and MAPs, or non-transparent using a common permutation zone during transmission. It is possible to achieve diversity by sending appropriately coded signals across different MR-BS and RS transmit antennas during the transmission of a burst to subordinate stations. The three modes of operation for cooperative relaying are cooperative source diversity, cooperative transmit diversity, and cooperative hybrid diversity.

For cooperative source diversity, the transmitting antennas simultaneously transmit the same signal using the same time-frequency resource. In cooperative transmit diversity mode, STC-encoded signals are transmitted across the transmitting antennas using the same time-frequency resource (refer to Section 8.4.8 for a list of valid STCs). Cooperative hybrid diversity is a combination of source and transmit diversity.

In a STC DL Zone with STC not set to "0b00", the RS shall perform STC encoding locally by using the STC Matrix as defined by STC_DL_Zone_IE (or MIMO DL Basic IE or MIMO DL Enhanced IE or HARQ MAP) for its assigned antenna number(s) as indicated in RS_CDC_REQRS_Config-CMD, and in the case of an incorrectly decoded burst, shall not transmit any data nor dedicated pilots, if any.not forward an incorrectly decoded burst to its subordinate stations. The pilot patterns for each RS antenna shall be based on the permutation, the number of antennas as indicated in STC_DL_Zone IE, and the antenna assignment. The antenna assignment will be effective until the next RS_Config-CMD message that includes cooperative diversity configuration.

Figure 323a is an example of local STC encoding at the RS. The STC Encoder is identical to the encoder in Figure 244[Figure 301 in Rev2] of 8.4.8.1.

In cooperative relaying, the frames sent by MR-BS and RS at a given frame time must arrive at the MS within the prefix interval, similar to MDHO.
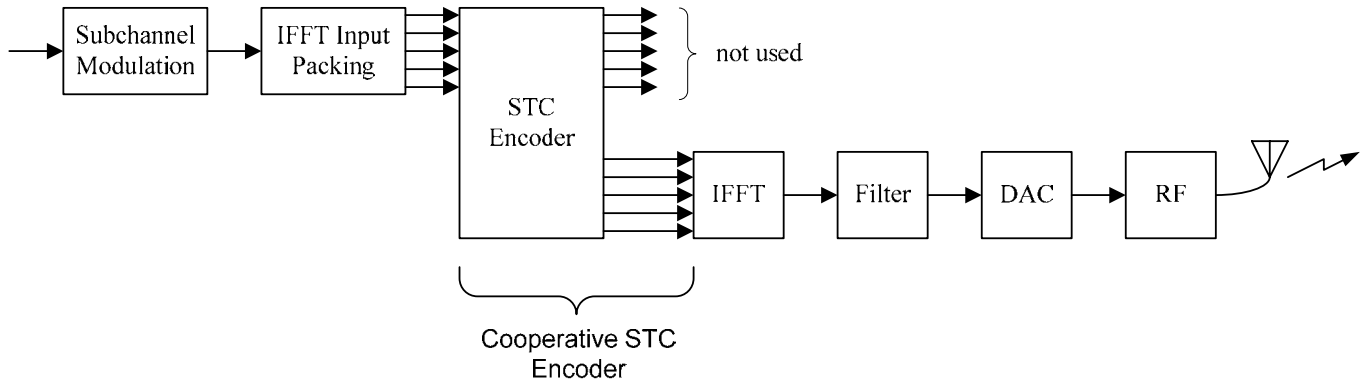

Figure 323a–A logical block example of local STC Encoding at RS. The STC Encoder is identical to the encoder in Figure 244[Figure 301 in Rev2] of Section 8.4.8.1.

[Insert new subclause 11.8.3.7.xx]

11.8.3.7.xx OFDMA RS downlink STC encoding support

This field indicates the different STC encoding capabilities by a RS in the downlink. Bits 12 and 13 indicate the number of physical transmit antennas. For all other bits, a bit value of 0 indicates "not supported" while 1 indicates "supported". A RS may have STC encoding capabilities that exceed its number of transmit antennas for the purpose of cooperative relay.

Type	Length	Value	Scope
TBA	2	Bit #0: 2-antenna STC matrix A	SBC-REQ (see 6.3.2.3.23)
		Bit #1: 2-antenna STC matrix B, vertical coding	SBC-RSP (see 6.3.2.3.24)
		Bit #2: 2-antenna STC matrix B, horizontal coding	
		Bit #3: 4-antenna STC matrix A	
		Bit #4: 4-antenna STC matrix B, vertical coding	
		Bit #5: 4-antenna STC matrix B, horizontal coding	
		Bit #6: 4-antenna STC matrix C, vertical coding	
		Bit #7: 4-antenna STC matrix C, horizontal coding	
		Bit #8: 3-antenna STC matrix A	
		Bit #9: 3-antenna STC matrix B	
		Bit #10: 3-antenna STC matrix C, vertical coding	
		Bit #11: 3-antenna STC matrix C, horizontal coding	
		Bits #12 & 13: Number of RS transmit antennas, less one	
		Bit #14-15: Reserved	

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