3GPP TSG RAN Meeting #16 ***RP-020437***
Marco Island, FL, U.S.A., 4 – 7, June 2002

CR-Form-v4

CHANGE REQUEST

⌘ **25.211** **CR** **147** ⌘ **rev** **4** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Specification of TX diversity for HSDPA
Source:	⌘	TSG RAN WG1
Work item code:	⌘	HSDPA-Phys
Date:	⌘	15 May 2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Complete the specification of HSDPA.
Summary of change:	⌘	The Tx diversity rules applicable to the HS-PDSCH, the associated DPCH and HS-SCCH are specified. Also channel bit encoding for 16QAM is specified for STTD.
Consequences if not approved:	⌘	TX diversity mode rules and encoding that apply to the physical channels of HSDPA are unknown.

Clauses affected:	⌘	5.3
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.3 Downlink physical channels

5.3.1 Downlink transmit diversity

Table 11 summarizes the possible application of open and closed loop transmit diversity modes on different downlink physical channel types. Simultaneous use of STTD and closed loop modes on the same physical channel is not allowed. In addition, if Tx diversity is applied on any of the downlink physical channels it shall also be applied on P-CCPCH and SCH. Regarding CPICH transmission in case of transmit diversity, see subclause 5.3.3.1.

With respect to the usage of Tx diversity on different radio links within an active set, the following rules apply:

- Different Tx diversity modes (STTD and closed loop) shall not be used on the radio links within one active set.
- No Tx diversity on one or more radio links shall not prevent UTRAN to use Tx diversity on other radio links within the same active set.
- If STTD is activated on one or several radio links in the active set, the UE shall operate STTD either on only those radio links where STTD has been activated or on all radio links in the active set.
- If closed loop TX diversity is activated on one or several radio links in the active set, the UE shall operate closed loop TX diversity either on only those radio links where closed loop TX diversity has been activated or on all radio links in the active set.

Furthermore, the transmit diversity mode used for a PDSCH frame shall be the same as the transmit diversity mode used for the DPCH associated with this PDSCH frame. The transmit diversity mode on the associated DPCH may not change during a PDSCH frame and within the slot prior to the PDSCH frame. This includes any change between no Tx diversity, open loop, closed loop mode 1 or closed loop mode 2.

Also, the transmit diversity mode used for a HS-SCCH and or a HS-PDSCH subframe shall be the same as the transmit diversity mode used for the DPCH associated with this HS-SCCH and or HS-PDSCH subframe. The transmit diversity mode on the associated DPCH may not change during a HS-SCCH and or HS-PDSCH subframe and within the slot prior to the HS-SCCH subframe. This includes any change between no Tx diversity, open loop, closed loop mode 1 or closed loop mode 2.

Table 11: Application of Tx diversity modes on downlink physical channel types
"X" – can be applied, "–" – not applied, "FFS" – for further study

Physical channel type	Open loop mode		Closed loop Mode
	TSTD	STTD	
P-CCPCH	–	X	–
SCH	X	–	–
S-CCPCH	–	X	–
DPCH	–	X	X
PICH	–	X	–
PDSCH	–	X	X
HS-PDSCH	–	X	FFS
HS-SCCH	–	X	FFS
AICH	–	X	–
CSICH	–	X	–
AP-AICH	-	X	-
CD/CA-ICH	-	X	-
DL-DPCCH for CPCH	-	X	X

5.3.1.1 Open loop transmit diversity

5.3.1.1.1 Space time block coding based transmit antenna diversity (STTD)

The open loop downlink transmit diversity employs a space time block coding based transmit diversity (STTD).

The STTD encoding is optional in UTRAN. STTD support is mandatory at the UE.

If higher layers signal that neither P-CPICH nor S-CPICH can be used as phase reference for the downlink DPCH for a radio link in a cell, the UE shall assume that STTD is not used for the downlink DPCH (and the associated PDSCH if applicable) in that cell.

For QPSK, STTD encoding is applied on blocks of 4 consecutive channel bits. A block diagram of a generic STTD encoder for channel bits b_0, b_1, b_2, b_3 is shown in the figure 9 below.

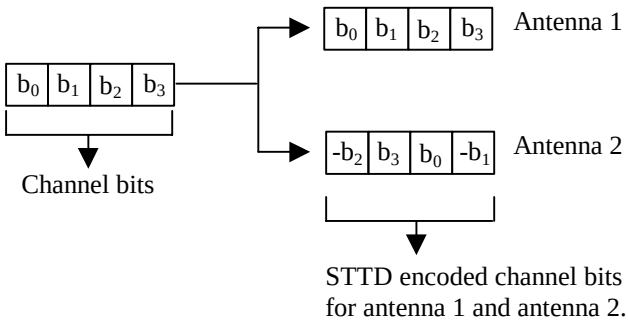

Figure 9: Generic block diagram of the STTD encoder for QPSK

For 16QAM, STTD operates on blocks of 8 consecutive symbols b_0, b_1, b_2, b_3, b_4, b_5, b_6, b_7 is shown in figure 10 below.

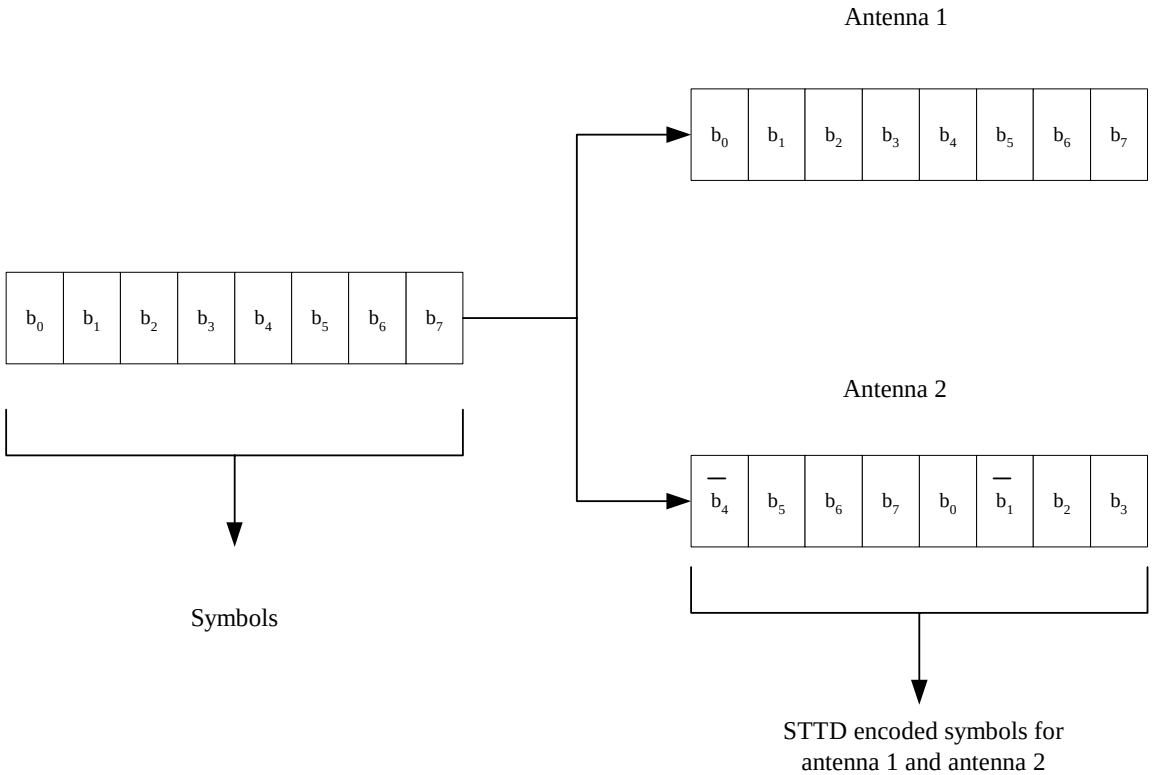

Figure 10: Generic block diagram of the STTD encoder for 16QAM

Channel coding, rate matching and interleaving is done as in the non-diversity mode. The bit b_i is real valued {0} for DTX bits and {1, -1} for all other channel bits.