3GPP TSG RAN Meeting #18 **RP-020849**
New Orleans, Louisiana, USA, 3 - 6 December, 2002

Title: **CRs (Rel-5) to TS 25.222**

Source: **TSG-RAN WG1**

Agenda item: **7.1.5**

3. Release 5 CRs

3.1 CRs with no links to other specifications

TS 25.222 **(RP-020849)**

No.	Spec	CR	Rev	R1 T-doc	Subject	Phase	Cat	Workitem	V_old	V_new
1	25.222	103	-	R1-02-1267	Correction of editorial Error	REL-5	F	TEI5	5.2.1	5.3.0
2	25.222	104	-	R1-02-1268	Miscellaneous Minor HSDPA Corrections	REL-5	F	HSDPA-Phys	5.2.1	5.3.0

3GPP TSG-RAN1 Meeting #29
Shanghai, China, 05. – 08.11.2002

Tdoc ⌘R1-02-1267

CR-Form-v7

CHANGE REQUEST

⌘	25.222	CR	103	⌘ rev	-	⌘	Current version:	5.2.1	⌘

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

Proposed change affects:	UICC apps⌘		ME	X	Radio Access Network	X	Core Network	

Title:	⌘	Correction of editorial Error		
Source:	⌘	TSG RAN WG1		
Work item code:	⌘	TEI5	***Date:*** ⌘	25/10/2002
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)* *Rel-6 (Release 6)*	

Reason for change:	⌘	The wrong implementation of the CR077(R1-02-0445) lead to a wrong figure in TS25.222. The figure of 3.84 Mcps TDD was by mistake also copied to the 1.28Mcps TDD section which now leads to the wrong interpretation, that the coding chain is exactly the same for the two TDD options e.g. subframe-segmentation is removed from Rel5 for 1.28Mcps TDD.
Summary of change:	⌘	The figure 2 (for 1.28 Mcps TDD) is corrected according to CR077(R1-02-0445) which had been approved at RAN#16.
Consequences if not approved:	⌘	Erroneous figure in 25.222

Clauses affected:	⌘	4.2				
		Y	**N**			
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/specs/CR.htm. Below is a brief summary:

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4.2 General coding/multiplexing of TrCHs

This section only applies to the transport channels: DCH, RACH, DSCH, USCH, BCH, FACH and PCH. Other transport channels which do not use the general method are described separately below.

Figure 1 illustrates the overall concept of transport-channel coding and multiplexing. Data arrives to the coding/multiplexing unit in form of transport block sets, once every transmission time interval. The transmission time interval is transport-channel specific from the set {5 ms$^{(*1)}$, 10 ms, 20 ms, 40 ms, 80 ms}.

Note: $^{(*1)}$ may be applied for PRACH for 1.28 Mcps TDD

The following coding/multiplexing steps can be identified:

- add CRC to each transport block (see subclause 4.2.1);
- TrBk concatenation / Code block segmentation (see subclause 4.2.2);
- channel coding (see subclause 4.2.3) ;
- radio frame size equalization (see subclause 4.2.4);
- interleaving (two steps, see subclauses 4.2.5 and 4.2.10);
- radio frame segmentation (see subclause 4.2.6);
- rate matching (see subclause 4.2.7);
- multiplexing of transport channels (see subclause 4.2.8);
- bit scrambling (see subclause 4.2.9);
- physical channel segmentation (see subclause 4.2.10);
- sub-frame segmentation(see subclause 4.2.12 only for 1.28Mcps TDD)
- mapping to physical channels (see subclause 4.2.13).

The coding/multiplexing steps for uplink and downlink are shown in figures 1 and 2.

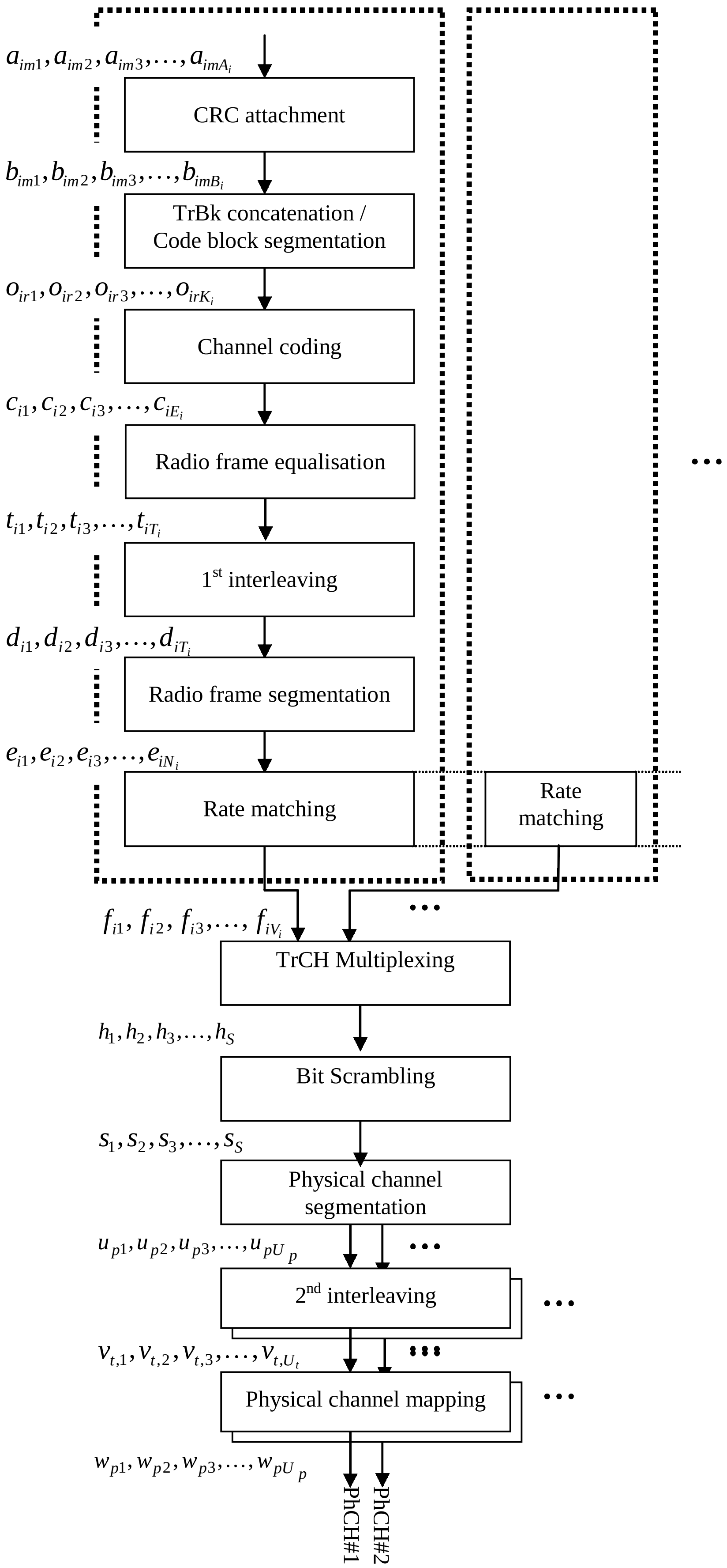
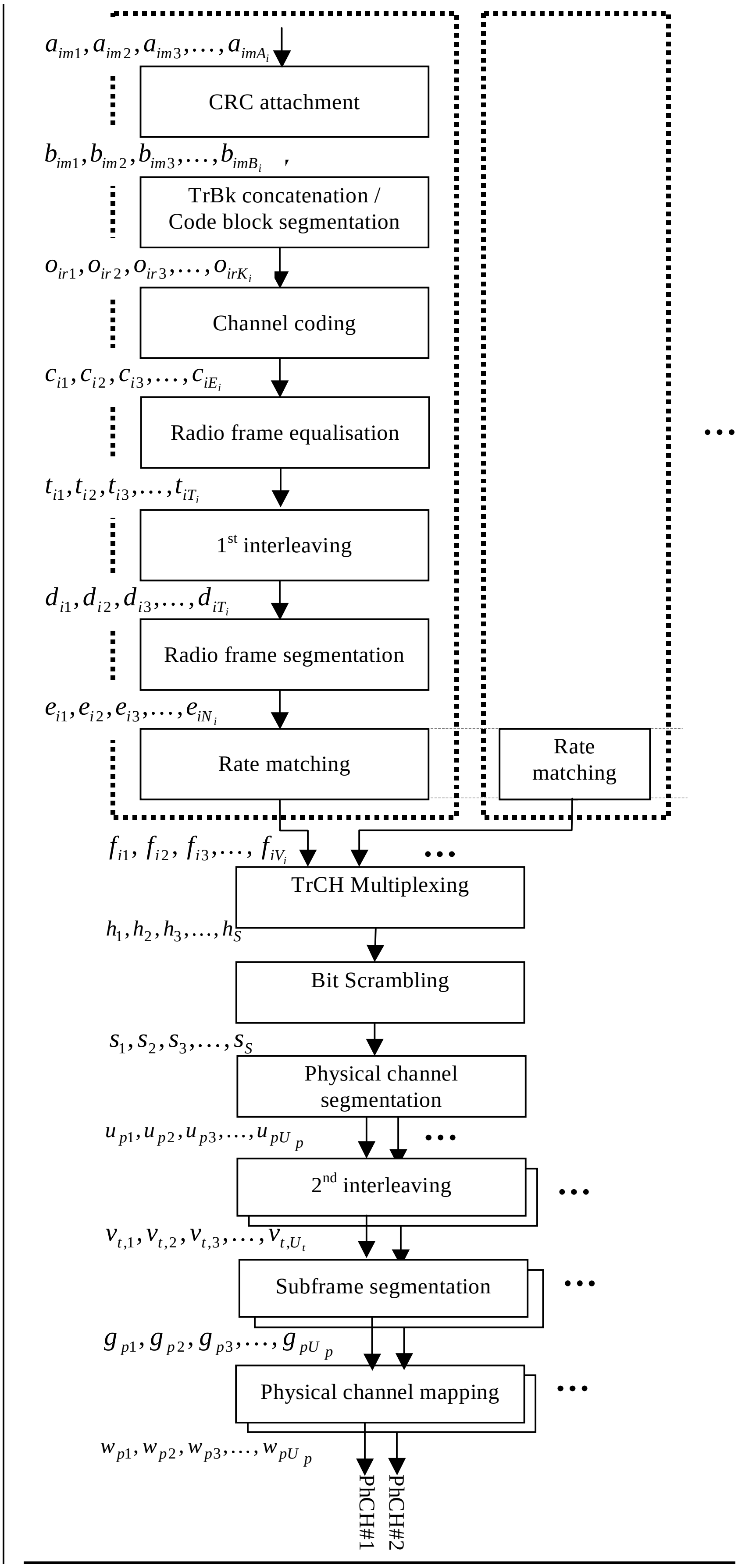


Figure 1: Transport channel multiplexing structure for uplink and downlink for 3.84Mcps TDD



$a_{im1}, a_{im2}, a_{im3}, \ldots, a_{imA_i}$
CRC attachment
$b_{im1}, b_{im2}, b_{im3}, \ldots, b_{imB_i}$
TrBk concatenation / Code block segmentation
$o_{ir1}, o_{ir2}, o_{ir3}, \ldots, o_{irK_i}$
Channel coding
$c_{i1}, c_{i2}, c_{i3}, \ldots, c_{iE_i}$
Radio frame equalisation
$t_{i1}, t_{i2}, t_{i3}, \ldots, t_{iT_i}$
1st interleaving
$d_{i1}, d_{i2}, d_{i3}, \ldots, d_{iT_i}$
Radio frame segmentation
$e_{i1}, e_{i2}, e_{i3}, \ldots, e_{iN_i}$
Rate matching
Rate matching
$f_{i1}, f_{i2}, f_{i3}, \ldots, f_{iV_i}$
TrCH Multiplexing
$h_1, h_2, h_3, \ldots, h_S$
Bit Scrambling
$s_1, s_2, s_3, \ldots, s_S$
Physical channel segmentation
$u_{p1}, u_{p2}, u_{p3}, \ldots, u_{pU_p}$
2nd interleaving
$v_{t,1}, v_{t,2}, v_{t,3}, \ldots, v_{t,U_t}$
Subframe segmentation
$g_{p1}, g_{p2}, g_{p3}, \ldots, g_{pU_p}$
Physical channel mapping
$w_{p1}, w_{p2}, w_{p3}, \ldots, w_{pU_p}$
PhCH#1
PhCH#2

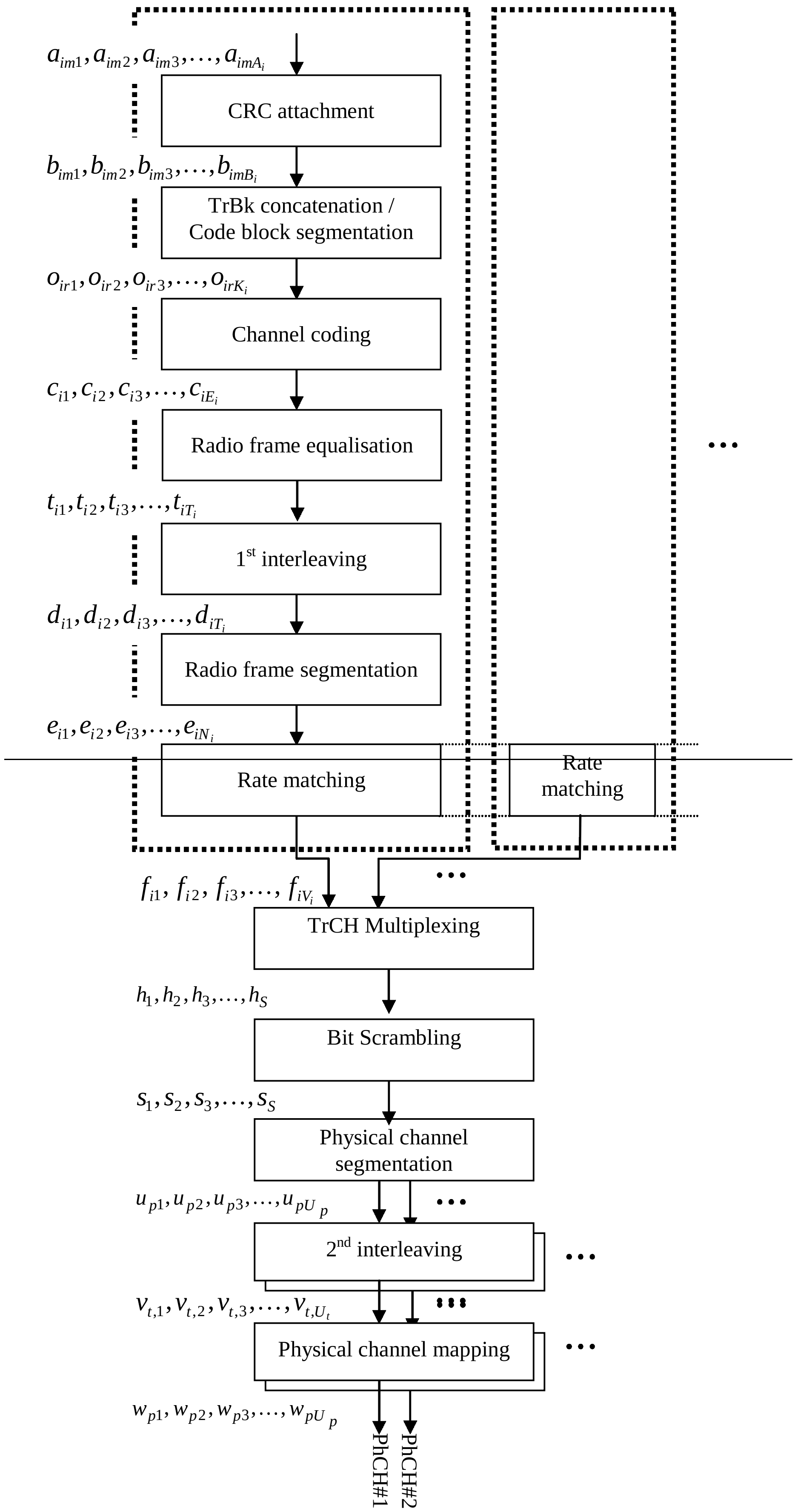


Figure 2: Transport channel multiplexing structure for uplink and downlink of 1.28Mcps TDD

3GPP TSG-RAN1 Meeting #29
Shanghai, China, 05 – 08 November 2002

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CHANGE REQUEST

⌘	**25.222**	**CR**	**104**	⌘ **rev**	**-**	⌘ Current version:	**5.2.1** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	CR 25.222–104 (Rel-5) Miscellaneous Minor HSDPA Corrections		
Source:	⌘	TSG RAN WG1		
Work item code:	⌘	HSDPA-Phys	***Date:*** ⌘	22/10/2002
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)* *Rel-6 (Release 6)*

Reason for change:	⌘	Bit separation parameters α and β not specified for 5 ms TTI. HARQ bit collection text is clarified following 25.212 CR 149 Incorrect index used in one of the HS-DSCH physical channel mapping equations Reference to the ASN.1 specification where MSB and LSB of bitstrings is defined is missing. Abbreviation TFRC is defined, but not used Figure 18c cannot be viewed.
Summary of change:	⌘	Specification of α and β bit separation parameters for 5 ms TTI. HARQ bit collection text is modified so that the case when Nt,sys = 0 is correctly handled. It is also clarified that writing in and reading out column by column are started from the first column. Index in HS-DSCH physical channel mapping equation corrected from $y_{y,k}$ to $y_{t,k}$ Reference to the ASN.1 specification where MSB and LSB of bitstrings is defined is added. Abbreviation TFRC is deleted. Figure 18c replaced with viewable version.
Consequences if not approved:	⌘	Incomplete and incorrect specification

Clauses affected:	⌘	2, 3.3, 4.2.7.2, 4.5.4.4, 4.5.8, 4.6, 4.6.1.6

		Y	N			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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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.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TS 25.202: "UE capabilities".

[2] 3GPP TS 25.211: "Transport channels and physical channels (FDD)".

[3] 3GPP TS 25.212: "Multiplexing and channel coding (FDD)".

[4] 3GPP TS 25.213: "Spreading and modulation (FDD)".

[5] 3GPP TS 25.214: "Physical layer procedures (FDD)".

[6] 3GPP TS 25.215: "Physical layer – Measurements (FDD)".

[7] 3GPP TS 25.221: "Transport channels and physical channels (TDD)".

[9] 3GPP TS 25.223: "Spreading and modulation (TDD)".

[10] 3GPP TS 25.224: "Physical layer procedures (TDD)".

[11] 3GPP TS 25.225: "Measurements".

[12] 3GPP TS 25.331: "RRC Protocol Specification".

[13] 3GPP TS 25.308: "High Speed Downlink Packet Access (HSDPA): Overall description (stage 2)".

[14] ITU-T Recommendation X.691 (12/97) "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

<ACRONYM>	<Explanation>
ARQ	Automatic Repeat on Request
BCH	Broadcast Channel
BER	Bit Error Rate
BS	Base Station
BSS	Base Station Subsystem
CBR	Constant Bit Rate
CCCH	Common Control Channel
CCTrCH	Coded Composite Transport Channel
CDMA	Code Division Multiple Access
CFN	Connection Frame Number
CQI	Channel Quality Indicator
CRC	Cyclic Redundancy Check
DCA	Dynamic Channel Allocation
DCCH	Dedicated Control Channel
DCH	Dedicated Channel
DL	Downlink
DRX	Discontinuous Reception
DSCH	Downlink Shared Channel
DTX	Discontinuous Transmission
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
FEC	Forward Error Control
FER	Frame Error Rate
GF	Galois Field
HARQ	Hybrid Automatic Repeat reQuest
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	Shared Control Channel for HS-DSCH
HS-SICH	Shared Information Channel for HS-DSCH
JD	Joint Detection
L1	Layer 1
L2	Layer 2
LLC	Logical Link Control
MA	Multiple Access
MAC	Medium Access Control
MS	Mobile Station
MT	Mobile Terminated
NRT	Non-Real Time
OVSF	Orthogonal Variable Spreading Factor
PC	Power Control
PCCC	Parallel Concatenated Convolutional Code
PCH	Paging Channel
PhCH	Physical Channel
PI	Paging Indicator (value calculated by higher layers)
P_q	Paging Indicator (indicator set by physical layer)
QoS	Quality of Service
QPSK	Quaternary Phase Shift Keying
RACH	Random Access Channel
RF	Radio Frequency

RLC	Radio Link Control
RMF	Recommended Modulation Format
RRC	Radio Resource Control
RRM	Radio Resource Management
RSC	Recursive Systematic Convolutional Coder
RT	Real Time
RTBS	Recommended Transport Block Size
RU	Resource Unit
RV	Redundancy Version
SCCC	Serial Concatenated Convolutional Code
SCH	Synchronization Channel
SNR	Signal to Noise Ratio
TCH	Traffic channel
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
~~TFRC~~	~~Transport Format Resouce Combination~~
TFRI	Transport Format Resouce Indicator
TPC	Transmit Power Control
TrBk	Transport Block
TrCH	Transport Channel
TTI	Transmission Time Interval
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
USCH	Uplink Shared Channel
UTRA	UMTS Terrestrial Radio Access
VBR	Variable Bit Rate

4.2.7.2 Bit separation and collection for rate matching

The systematic bits of turbo encoded TrCHs shall not be punctured, the other bits may be punctured. The systematic bits, first parity bits, and second parity bits in the bit sequence input to the rate matching block are therefore separated into three sequences.

The first sequence contains:

- All of the systematic bits that are from turbo encoded TrCHs.
- From 0 to 2 first and/or second parity bits that are from turbo encoded TrCHs. These bits come into the first sequence when the total number of bits in a block after radio frame segmentation is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second sequence contains:

- All of the first parity bits that are from turbo encoded TrCHs, except those that go into the first sequence when the total number of bits is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The third sequence contains:

- All of the second parity bits that are from turbo encoded TrCHs, except those that go into the first sequence when the total number of bits is not a multiple of three.
- Some of the systematic, first parity and second parity bits that are for trellis termination.

The second and third sequences shall be of equal length, whereas the first sequence can contain from 0 to 2 more bits. Puncturing is applied only to the second and third sequences.

The bit separation function is transparent for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition. The bit separation and bit collection are illustrated in figures 5 and 6.

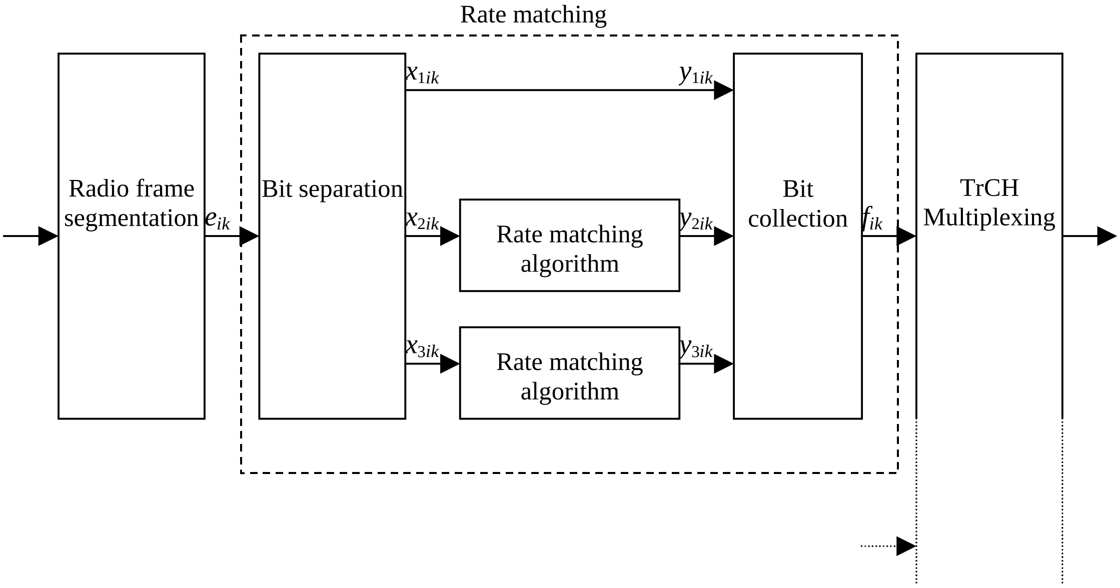


Figure 5: Puncturing of turbo encoded TrCHs

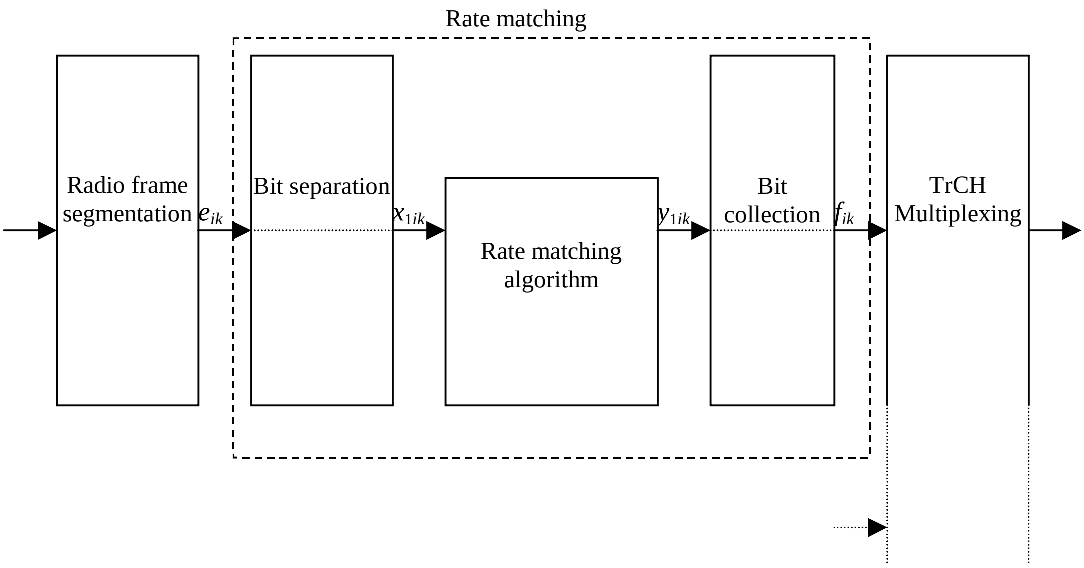


Figure 6: Rate matching for uncoded TrCHs, convolutionally encoded TrCHs, and for turbo encoded TrCHs with repetition

The bit separation is dependent on the 1st interleaving and offsets are used to define the separation for different TTIs. *b* indicates the three sequences defined in this section, with *b*=1 indicating the first sequence, *b* = 2 the second one, and *b* = 3 the third one.

The offsets α_b for these sequences are listed in table 6.

Table 6: TTI dependent offset needed for bit separation

TTI (ms)	α_1	α_2	α_3
5, 10, 40	0	1	2
20, 80	0	2	1

The bit separation is different for different radio frames in the TTI. A second offset is therefore needed. The radio frame number for TrCH *i* is denoted by n_i. and the offset by β_{n_i} .

Table 7: Radio frame dependent offset needed for bit separation

TTI (ms)	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7
5, 10	0	NA	NA	NA	NA	NA	NA	NA
20	0	1	NA	NA	NA	NA	NA	NA
40	0	1	2	0	NA	NA	NA	NA
80	0	1	2	0	1	2	0	1

4.5.4.4 HARQ bit collection

The HARQ bit collection is achieved using a rectangular interleaver of size $N_{row} \times N_{col}$.

The number of rows and columns are determined from:

$$N_{row} = 4 \text{ for 16QAM and } N_{row} = 2 \text{ for QPSK}$$

$$N_{col} = N_{data} / N_{row}$$

where N_{data} is used as defined in 4.5.4.3 above.

Data is written into the interleaver column by column, and read out of the interleaver column by column, starting from the first column.

$N_{t,sys}$ is the number of transmitted systematic bits. Intermediate values N_r and N_c are calculated using:

$$N_r = \left\lfloor \frac{N_{t,sys}}{N_{col}} \right\rfloor \text{ and } N_c = N_{t,sys} - N_r \cdot N_{col} .$$

If $N_c = 0$ and $N_r > 0$, the systematic bits are written into rows 1… N_r.

Otherwise systematic bits are written into rows 1… N_r+1 in the first N_c columns and, if $N_r > 0$, also into rows 1… N_r in the remaining N_{col}-N_c columns.

The remaining space is filled with parity bits. The parity bits are written column wise into the remaining rows of the respective columns. Parity 1 and 2 bits are written in alternating order, starting with a parity 2 bit in the first available column with the lowest index number.

In the case of 16QAM for each column the bits are read out of the interleaver in the order row 1, row 2, row 3, row 4. In the case of QPSK for each column the bits are read out of the interleaver in the order row1, row2.

4.5.8 Physical channel mapping for HS-DSCH

The HS-PDSCH is defined in [7]. The bits input to the physical channel mapping are denoted by $r_1, r_2, ..., r_R$, where R is the number of physical channel bits in the allocation for the current TTI. These bits are mapped to the physical channel bits, $\{w_{t,p,j} : t = 1, 2, ..., T; p = 1, 2, ..., C; j = 1, 2, ..., U_t\}$, where t is the timeslot index, T is the number of timeslots in the allocation message, p is the physical channel index, C is the number of codes per timeslot in the allocation message, j is the physical channel bit index and U_t is the number of bits per physical channel in timeslot t. The timeslot index, t, increases with increasing timeslot number; the physical channel index, p, increases with increasing channelisation code index, and the physical channel bit index, j, increases with increasing physical channel bit position in time.

The bits r_k shall be mapped to the PhCHs according to the following rule :

Define $\{y_{t,k} : k = 1, 2, ..., C \cdot U_t\}$ to be the set of bits to be transmitted in timeslot t as follows :

$$y_{1,k} = r_k \qquad \text{for } k = 1, 2, ..., C\cdot U_1$$

$$y_{2,k} = r_{k+C\cdot U_1} \qquad \text{for } k = 1, 2, ..., C\cdot U_2$$

…

$$y_{T,k} = r_{k+C\sum_{t=1}^{T-1} U_t} \qquad \text{for } k = 1, 2, ..., C\cdot U_T$$

When the modulation level applied to the physical channels is 16- QAM :

The physical channel p used to transmit the k^{th} bit in the sequence $y_{t,k}$ is :

$$p = \left\lfloor \frac{k-1}{4} \right\rfloor \bmod C + 1$$

If p is odd then :

$$w_{t,p,j} = y_{t,k} \text{ where } j = 4 \cdot \left\lfloor \frac{k-1}{4 \cdot C} \right\rfloor + (k-1) \bmod 4 + 1$$

If p is even then :

$$w_{t,p,j} = y_{t,k} \text{ where } j = U_t - 4 \cdot \left\lfloor \frac{k-1}{4 \cdot C} \right\rfloor - 3 + (k-1) \bmod 4$$

Otherwise, when the modulation level applied to the physical channels is QPSK :

The physical channel p used to transmit the k^{th} bit in the sequence $y_{t,k}$ is :

$$p = (k-1) \bmod C + 1$$

If p is odd then :

$$w_{t,p,j} = y_{t,k} \text{ where } j = \left\lfloor \frac{k-1}{C} \right\rfloor + 1$$

If p is even then :

~~$w_{t,p,j} = y_{y,k}$~~ $w_{t,p,j} = y_{t,k}$ where $j = U_t - \left\lfloor \frac{k-1}{C} \right\rfloor$

4.6 Coding/Multiplexing for HS-SCCH

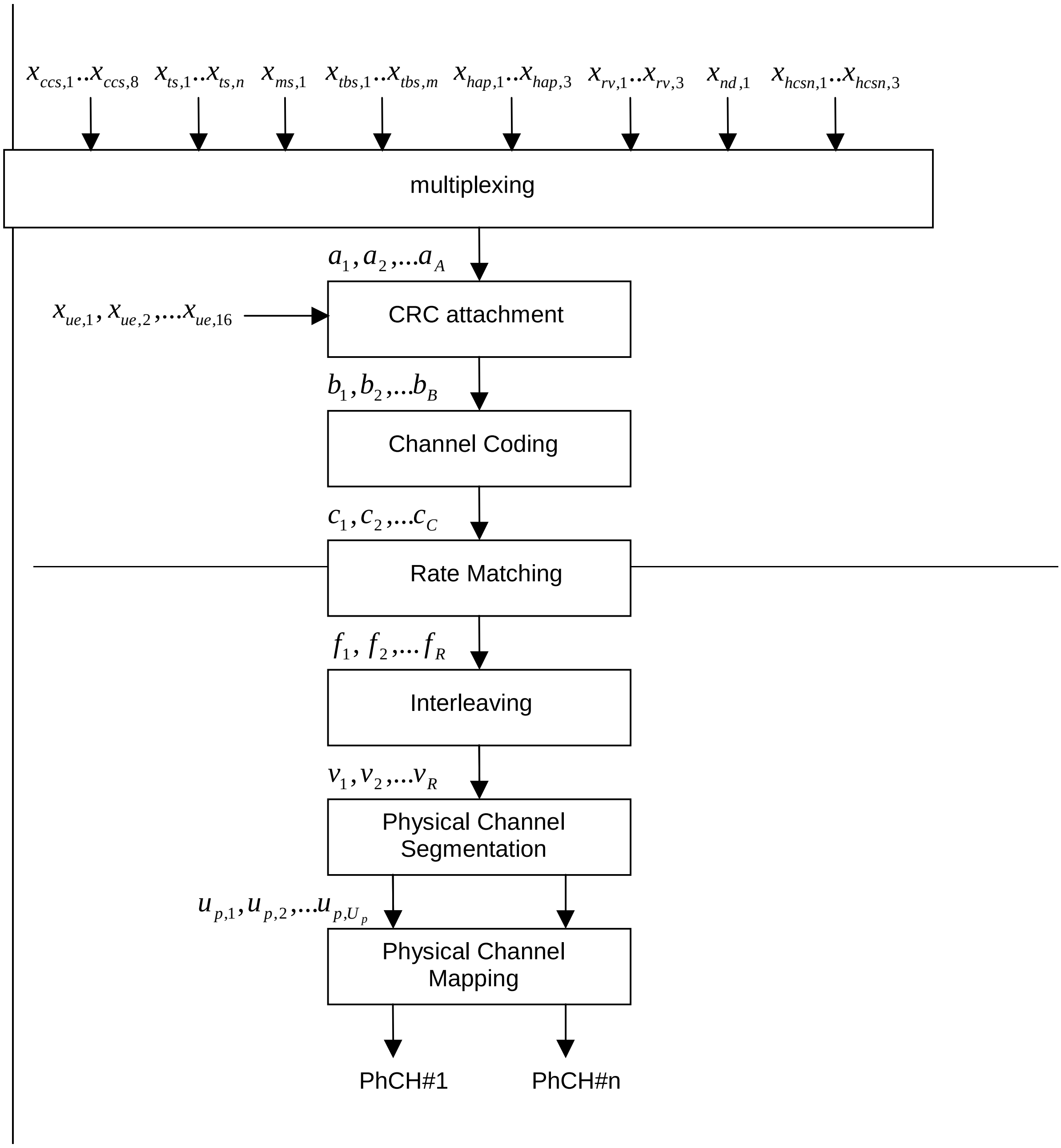
The following information, provided by higher layers, is transmitted by means of the HS-SCCH physical channel.

- Channelisation-code-set information (8 bits): $x_{ccs,1}$, $x_{ccs,2}$, …, $x_{ccs,8}$
- Time slot information (*n* bits where *n* = 5 for 1.28 Mcps TDD and *n* = 13 for 3.84 Mcps TDD): $x_{ts,1}$, $x_{ts,2}$, …, $x_{ts,n}$
- Modulation scheme information (1 bit): $x_{ms,1}$
- Transport-block size information (m bits where m = 6 for 1.28 Mcps TDD and m = 9 for 3.84 Mcps TDD): $x_{tbs,1}$, $x_{tbs,2}$, …, $x_{tbs,m}$
- Hybrid-ARQ process information (3 bits): $x_{hap,1}$, $x_{hap,2}$, $x_{hap,3}$
- Redundancy version information (3 bits): $x_{rv,1}$, $x_{rv,2}$,$x_{rv,3}$
- New data indicator (1 bit): $x_{nd,1}$
- HS-SCCH cyclic sequence number (3 bits): $x_{hcsn,1}$, $x_{hcsn,2}$, $x_{hcsn,3}$
- UE identity (16 bits): $x_{ue,1}$, $x_{ue,2}$, …, $x_{ue,16}$

The following coding/multiplexing steps can be identified:

- multiplexing of HS-SCCH information (see subclause 4.6.2)
- CRC attachment (see subclause 4.6.3);
- channel coding (see subclause 4.6.4);
- rate matching (see subclause 4.6.5);
- interleaving for HS-SCCH (see subclause 4.6.6);
- mapping to physical channels (see subclauses 4.6.7 and 4.6.8).

The general coding/multiplexing flow is shown in Figure 18c.


$x_{ccs,1}..x_{ccs,8}$
$x_{ts,1}..x_{ts,n}$
$x_{ms,1}$
$x_{tbs,1}..x_{tbs,m}$
$x_{hap,1}..x_{hap,3}$
$x_{rv,1}..x_{rv,3}$
$x_{nd,1}$
$x_{hcsn,1}..x_{hcsn,3}$
multiplexing
$a_1, a_2, ...a_A$
$x_{ue,1}, x_{ue,2}, ...x_{ue,16}$
CRC attachment
$b_1, b_2, ...b_B$
Channel Coding
$c_1, c_2, ...c_C$
Rate Matching
$f_1, f_2, ...f_R$
Interleaving
$v_1, v_2, ...v_R$
Physical Channel Segmentation
$u_{p,1}, u_{p,2}, ...u_{p,U_p}$
Physical Channel Mapping
PhCH#1
PhCH#n

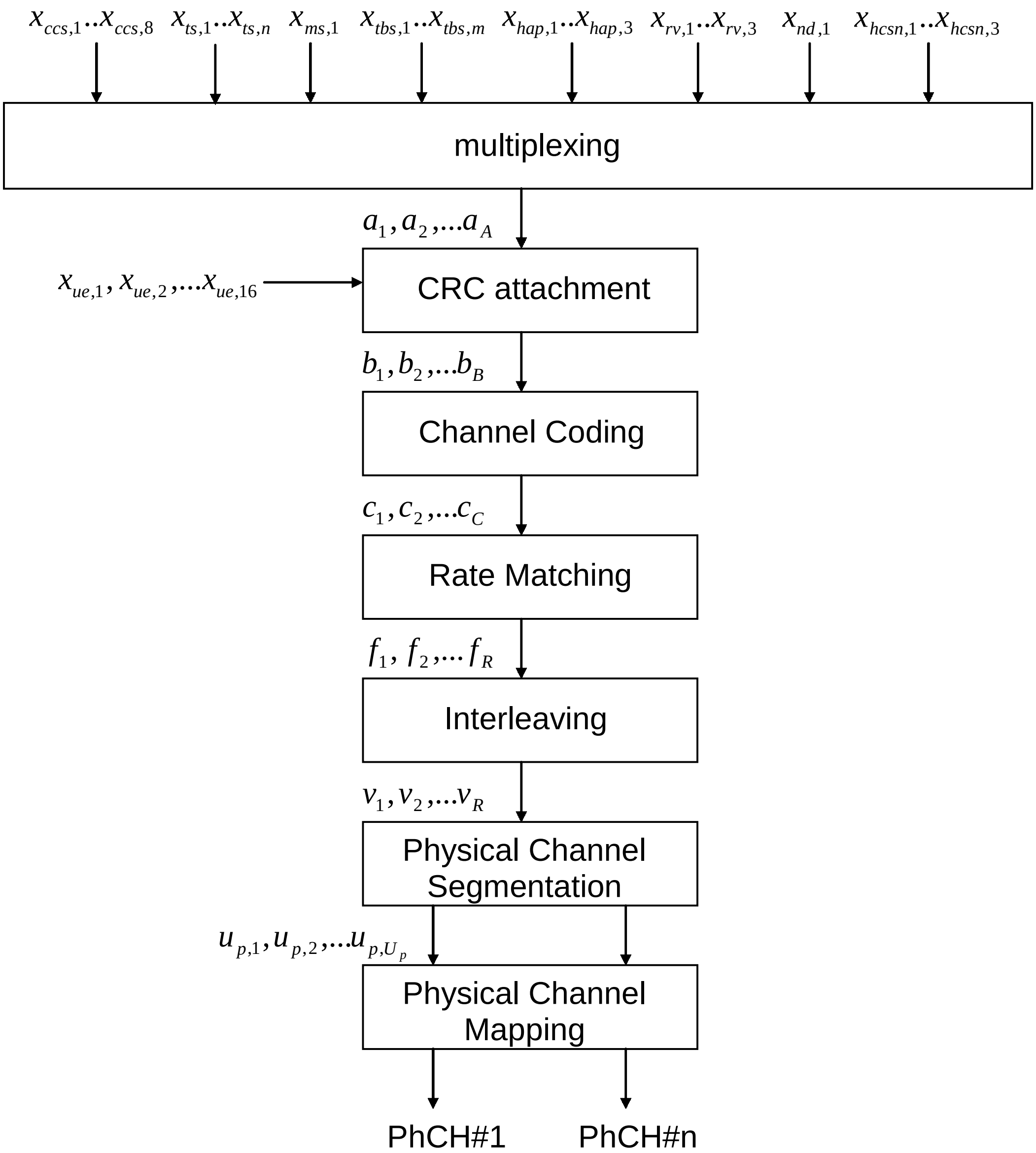


Figure 18c Coding and Multiplexing for HS-SCCH

4.6.1.6 UE identity

The UE identity is the HS-DSCH Radio Network Identifier (H-RNTI) defined in [12]. This is mapped such that $x_{ue,1}$ corresponds to the MSB and $x_{ue,16}$ to the LSB, cf. [14].