

**TSG-RAN Meeting #9  
Hawaii, U.S.A. , 20-22 September 2000**

**RP-000349**

**Title:            Agreed CR to TR 25.944**

**Source:          TSG-RAN WG1**

**Agenda item:  5.1.3**

<b>No.</b>	<b>R1 T-doc</b>	<b>TR</b>	<b>CR</b>	<b>Rev</b>	<b>Subject</b>	<b>Cat</b>	<b>Current</b>	<b>New</b>
1	R1-000928	25.944	002	2	TDD related changes for TR25.944	F	3.1.0	3.2.0



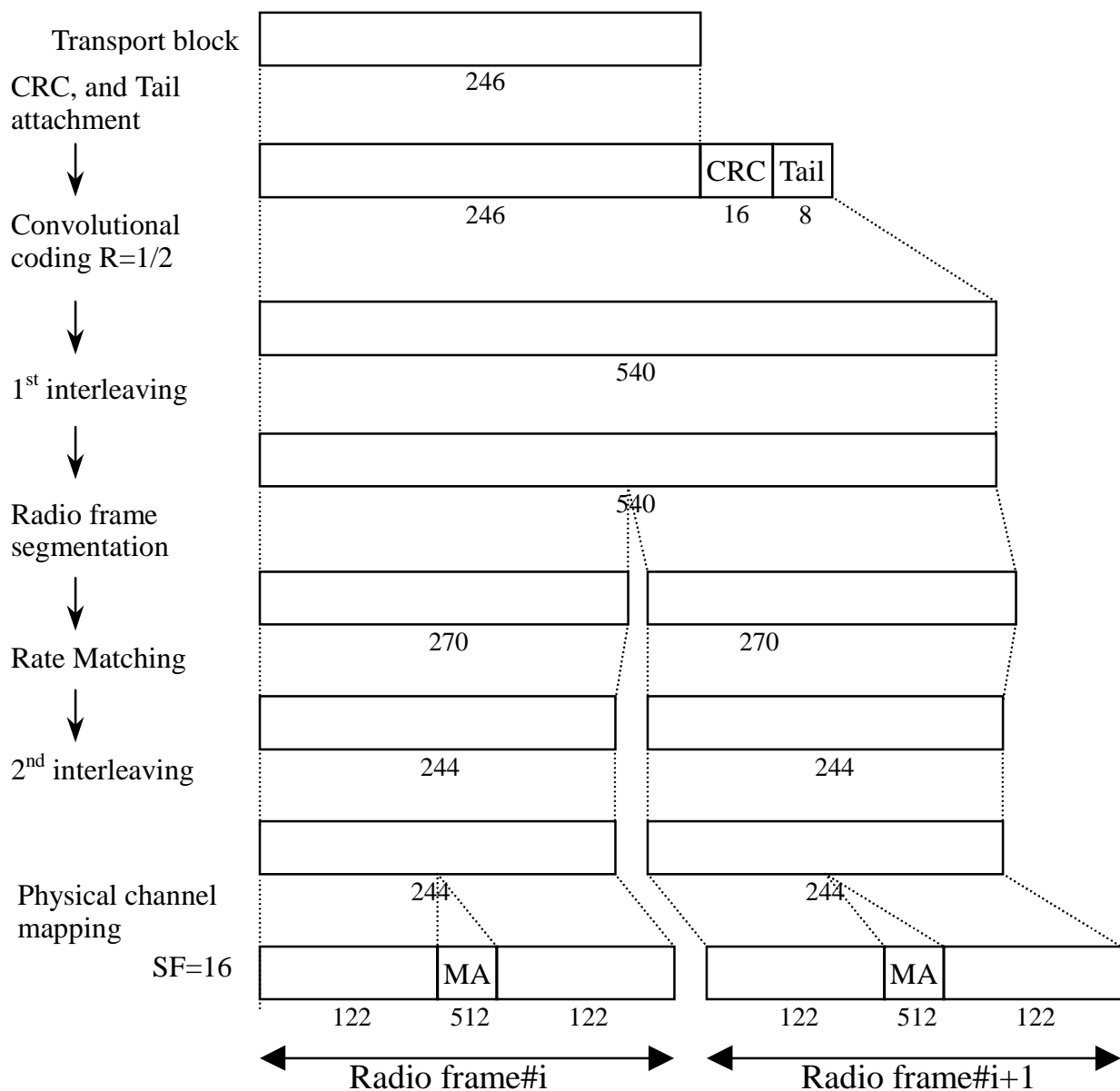
## 4.2 TDD mode

### 4.2.1 Downlink

#### 4.2.1.1 BCH

**Table 16: Parameters for BCH**

Transport block size	246 bits
CRC	16 bits
Coding	CC, coding rate = 1/2
TTI	20 ms
Midamble	512 chips
Codes and time slots	SF = 16 x 1 x 1 time slot
TFCI	0 bit
TPC	0 bit

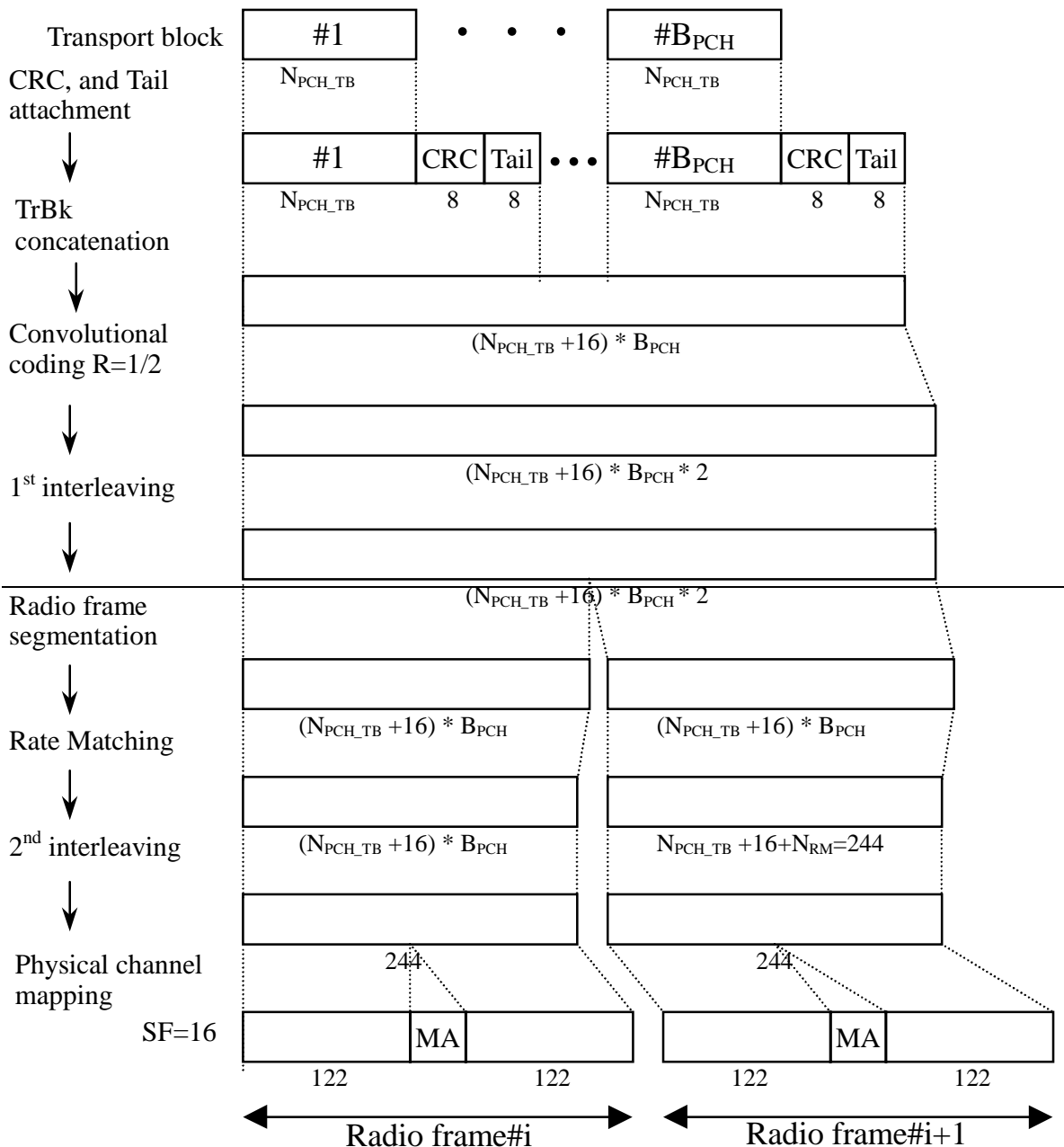


**Figure 20: Channel coding for BCH**

## 4.2.1.2 Example for PCH and FACH

Table 17: Parameters for PCH and FACH

Transport block size	PCH	$N_{PCH}=64$ or 240 bits
	FACH1	360 bits
	FACH2	168 bits
Transport block set size	PCH	$64 \cdot B_{PCH}$ or $240 \cdot B_{PCH}$ bits ( $B_{PCH}=0,1$ )
	FACH1	$360 \cdot B_{FACH1}$ bits ( $B_{FACH1}=0,1$ )
	FACH2	$168 \cdot B_{FACH2}$ bits ( $B_{FACH2}=0,1,2,3$ )
CRC		8 bits
Coding	PCH, FACH2	CC, coding rate = 1/2
	FACH1	TC
TTI		20-10 ms
Midamble		512 chips
Codes and time slots		SF = 16 x 1-2 x 1 time slot
TFCI		0-16 bit
TPC		0 bit



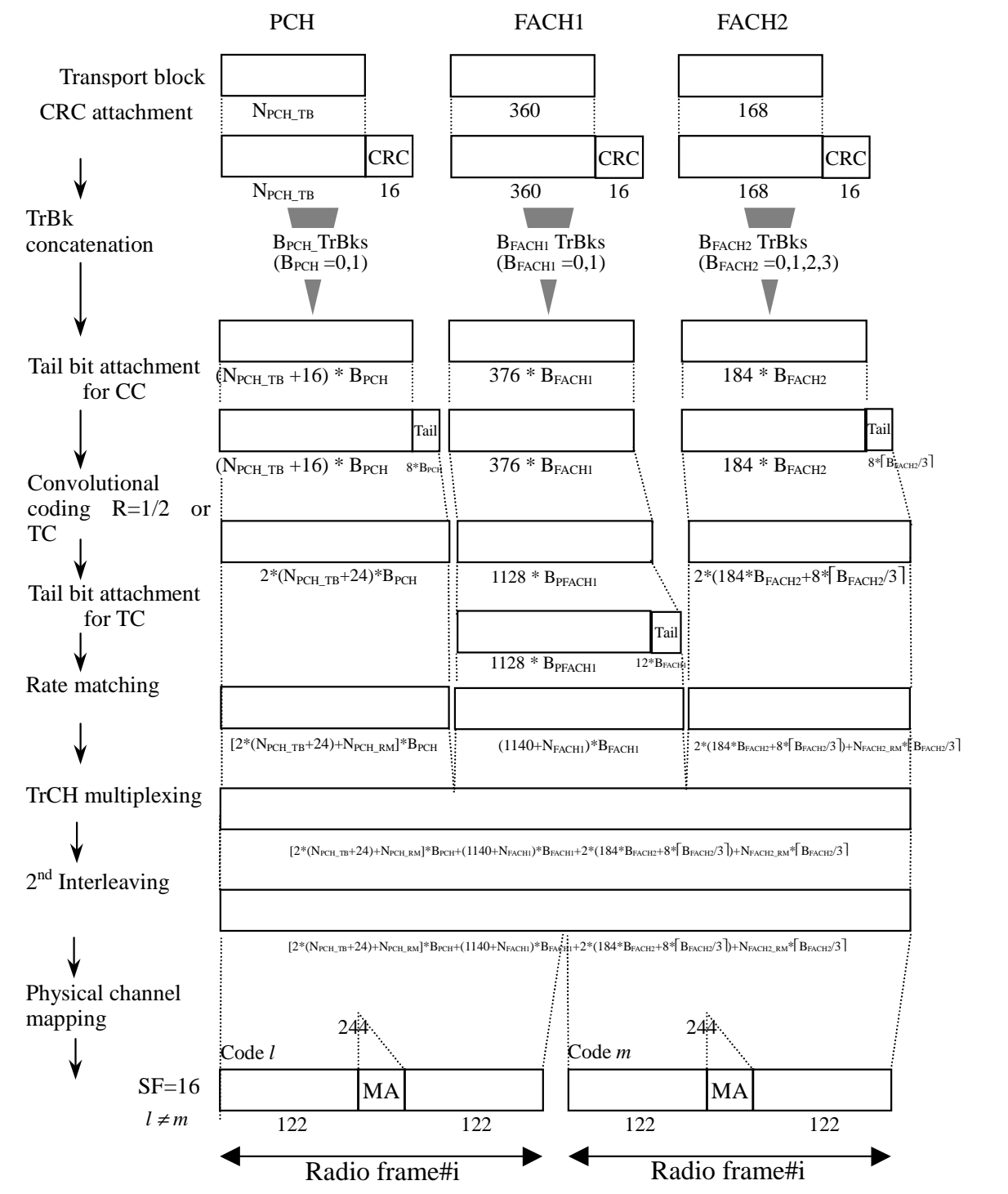


Figure 21: Channel coding and multiplexing example for PCH and FACH

4.2.1.3 Example for FACH

Table 18: Parameters for FACH

CRC	8-bits
Coding	CC, coding rate = 1/2
TTI	20 ms
Midamble	512-chips
Codes and time slots	SF = 16 x 1 x 1 time slot
TFI	0-bit
TPC	0-bit

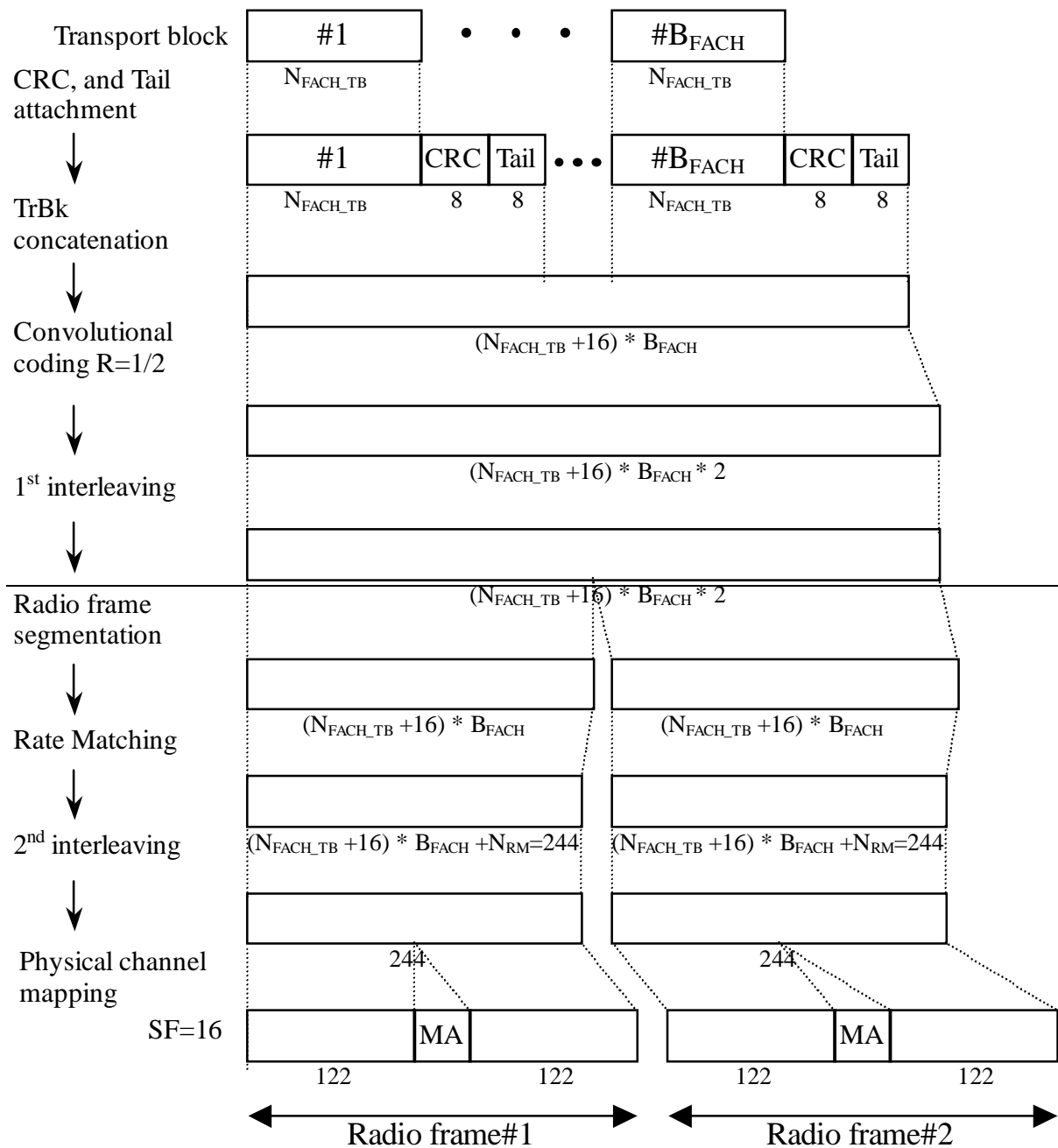


Figure 22: Channel coding and multiplexing example for FACH

4.2.1.4 Example for DCH

4.2.1.4.1 DCH-> Radio frame segmentation

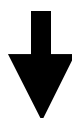
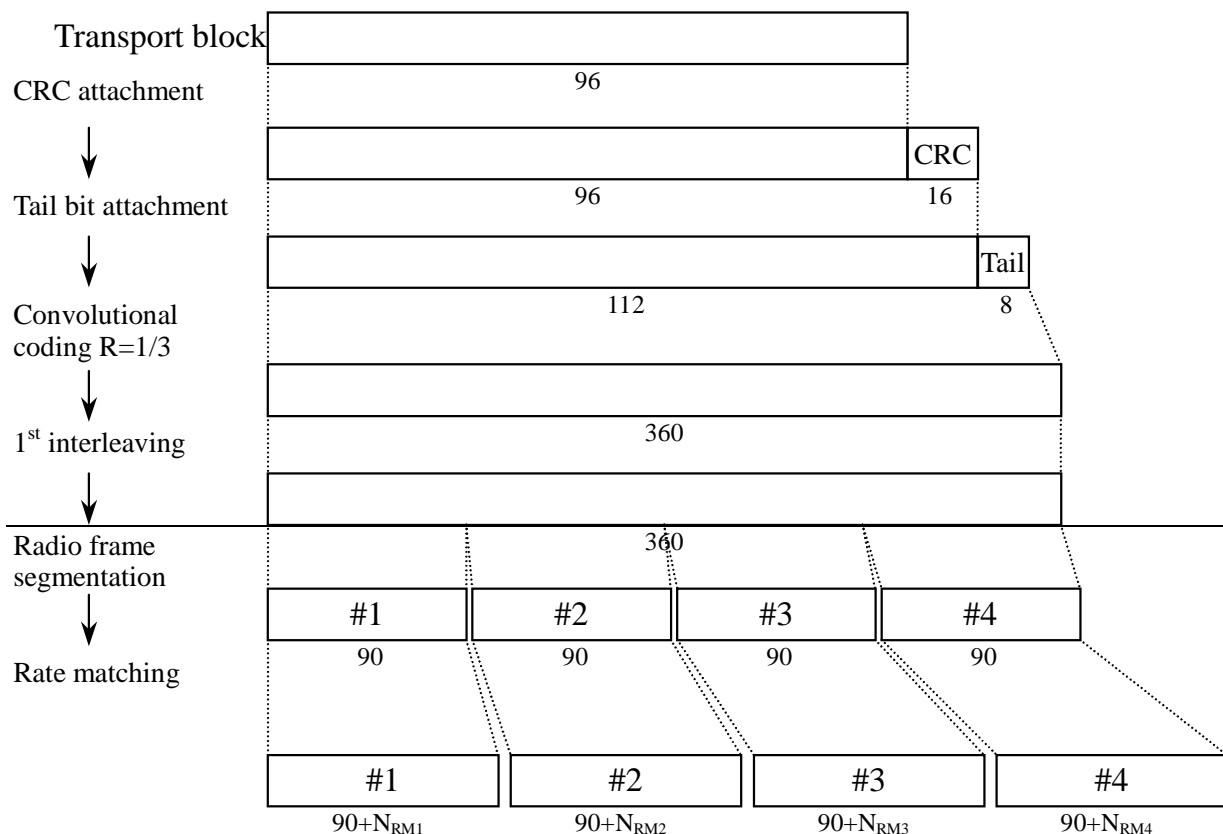
4.2.1.4.1.1 Example for 23.4 kbps data

NOTE: This example can be applied to DCCH.

NOTE: In this example, it is assumed that maximum data rate of RLC payload is 3.4kbps, and that MAC and RLC overhead in a transport block is 12 bits.

**Table 19: Parameter examples for 23.4 kbps data**

Transport block size	96-148 bits
Transport block set size	96-148*B bits (B=0..1)
CRC	16 bits
Coding	CC, coding rate = 1/3
TTI	40 ms



To TrCh Multiplexing



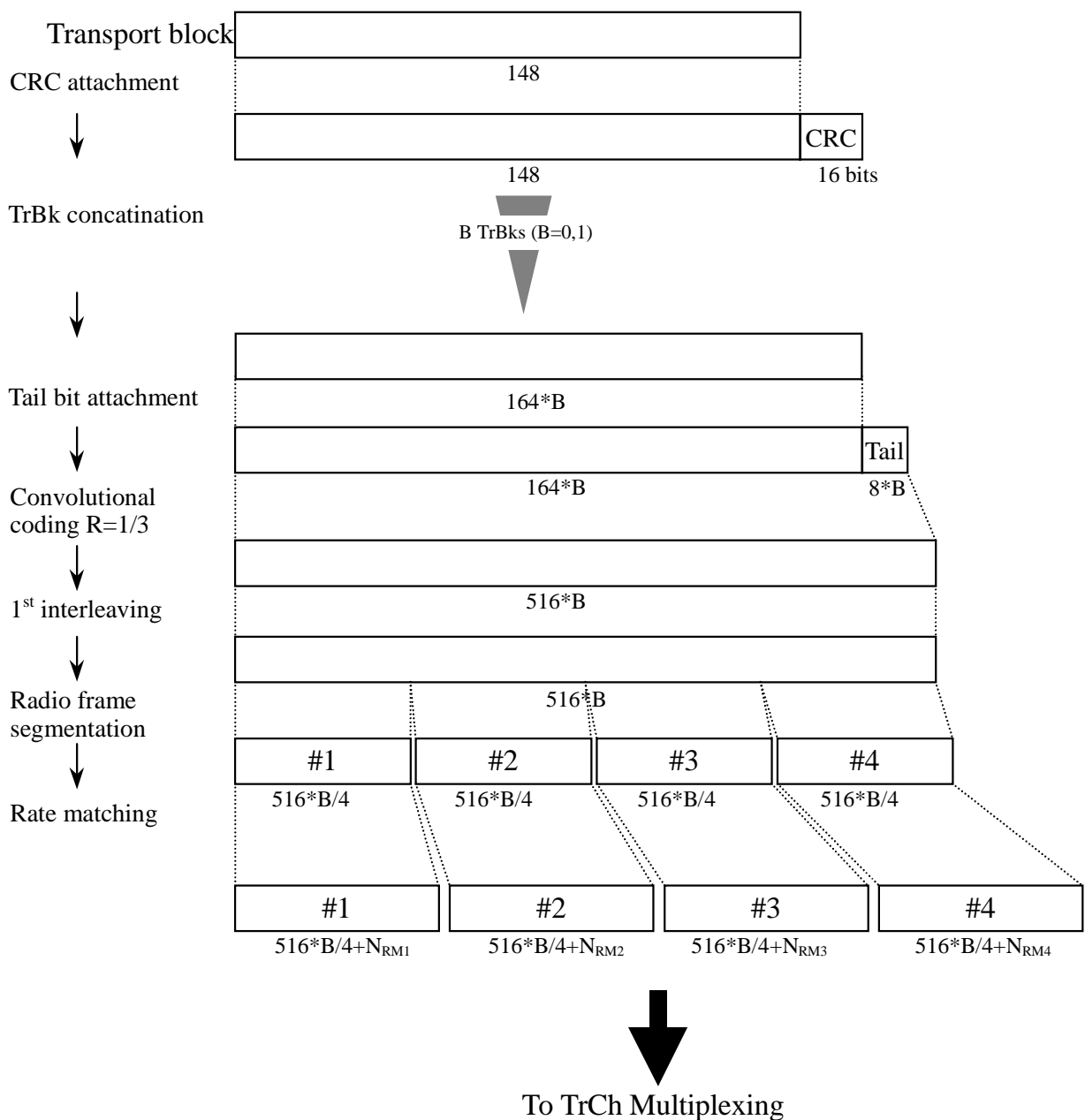


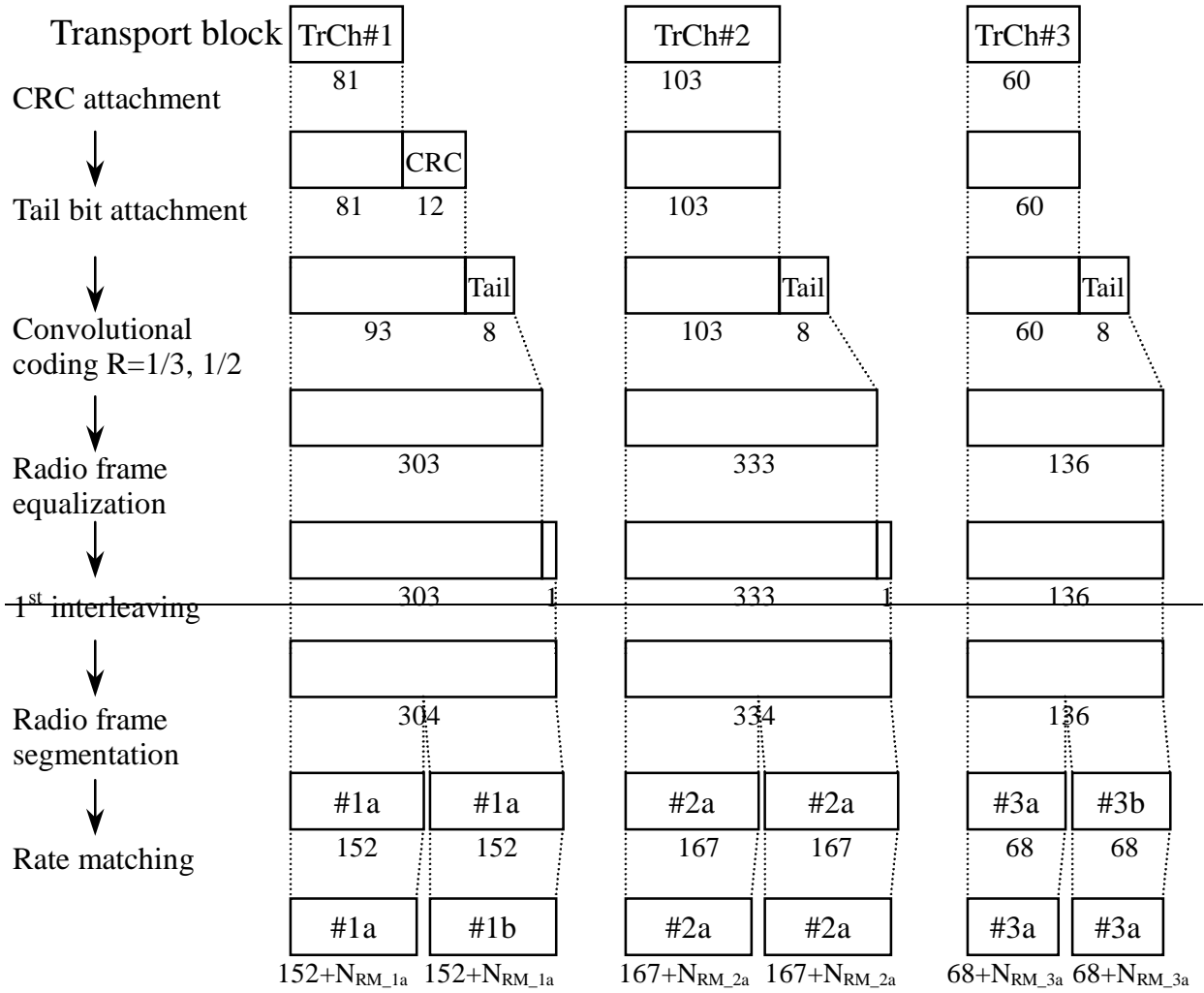
Figure 23: Channel coding and multiplexing example for 23.4 kbps data

## 4.2.1.4.1.2 Example for 12.2 kbps data

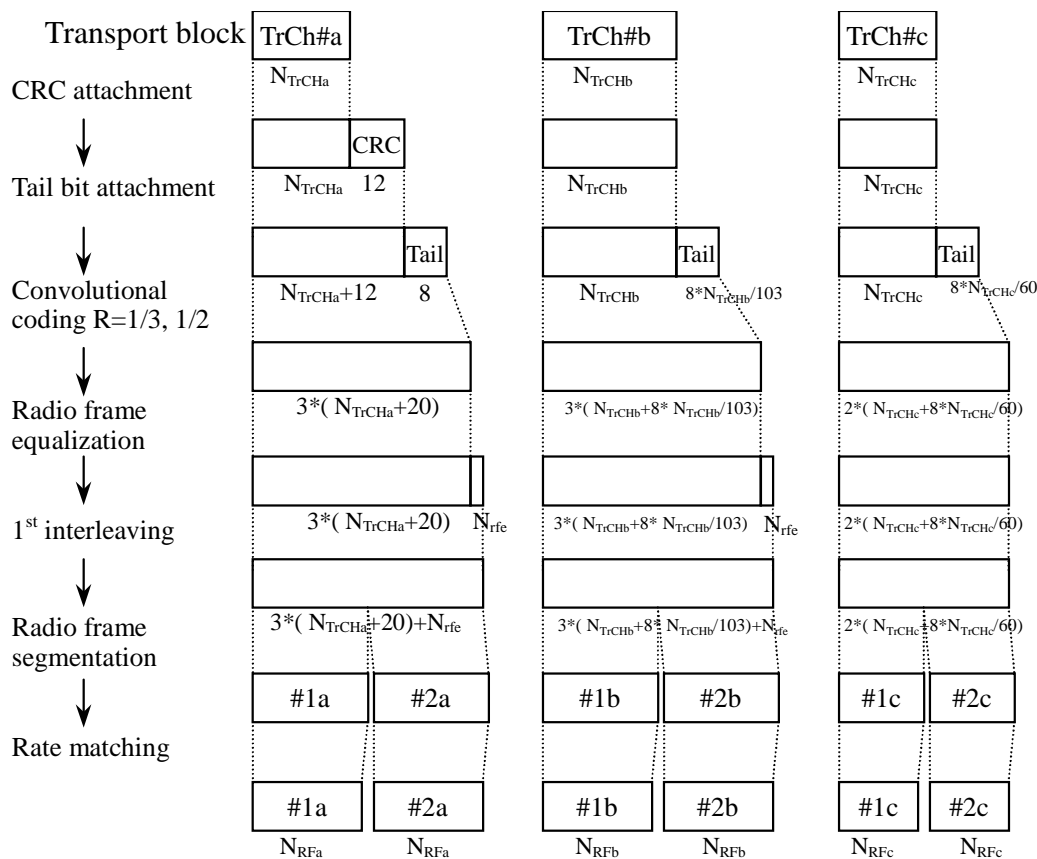
NOTE: This example can be applied to AMR speech.

**Table 20: Parameter examples for 12.2 kbps data**

The number of TrChs		3
Transport block size	TrCH#a	$N_{TrCHa} = 0, 39 \text{ or } 81, \text{ and } 60$ bits
	TrCH#b	$N_{TrCHb} = 0 \text{ or } 103$ bits
	TrCH#c	$N_{TrCHc} = 0 \text{ or } 60$ bits
Transport block set size	#1	$N_{TrCHa} = 81, N_{TrCHb} = 103, N_{TrCHc} = 60$ bits
	#2	$N_{TrCHa} = 39, N_{TrCHb} = 0, N_{TrCHc} = 0$ bits
	#3	$N_{TrCHa} = 0, N_{TrCHb} = 0, N_{TrCHc} = 0$ bits
CRC		12 bits (attached only to TrCh#1a)
CRC parity bit attachment for 0 bit transport block		Applied only to TrCH#a
Coding		CC,
TTI		coding rate = 1/3 for TrCh#1a, 2b coding rate = 1/2 for TrCh#3c 20 ms



To TrCh Multiplexing



$$\begin{aligned}
 N_{RFa} &= [3 * (N_{TrCHa} + 20) + N_{RMa} + N_{rfe}] / 2 \\
 N_{RFb} &= [3 * (N_{TrCHb} + 8 * N_{TrCHb} / 103) + N_{RMb} + N_{rfe}] / 2 \\
 N_{RFc} &= [2 * (N_{TrCHc} + 8 * N_{TrCHc} / 60) + N_{RMc}] / 2
 \end{aligned}$$

To TrCh Multiplexing

**\* CRC and tail bits for TrCH#a is attached even if  $N_{TrCHa}=0$  bits since CRC parity bit attachment for 0 bit transport block is applied.**

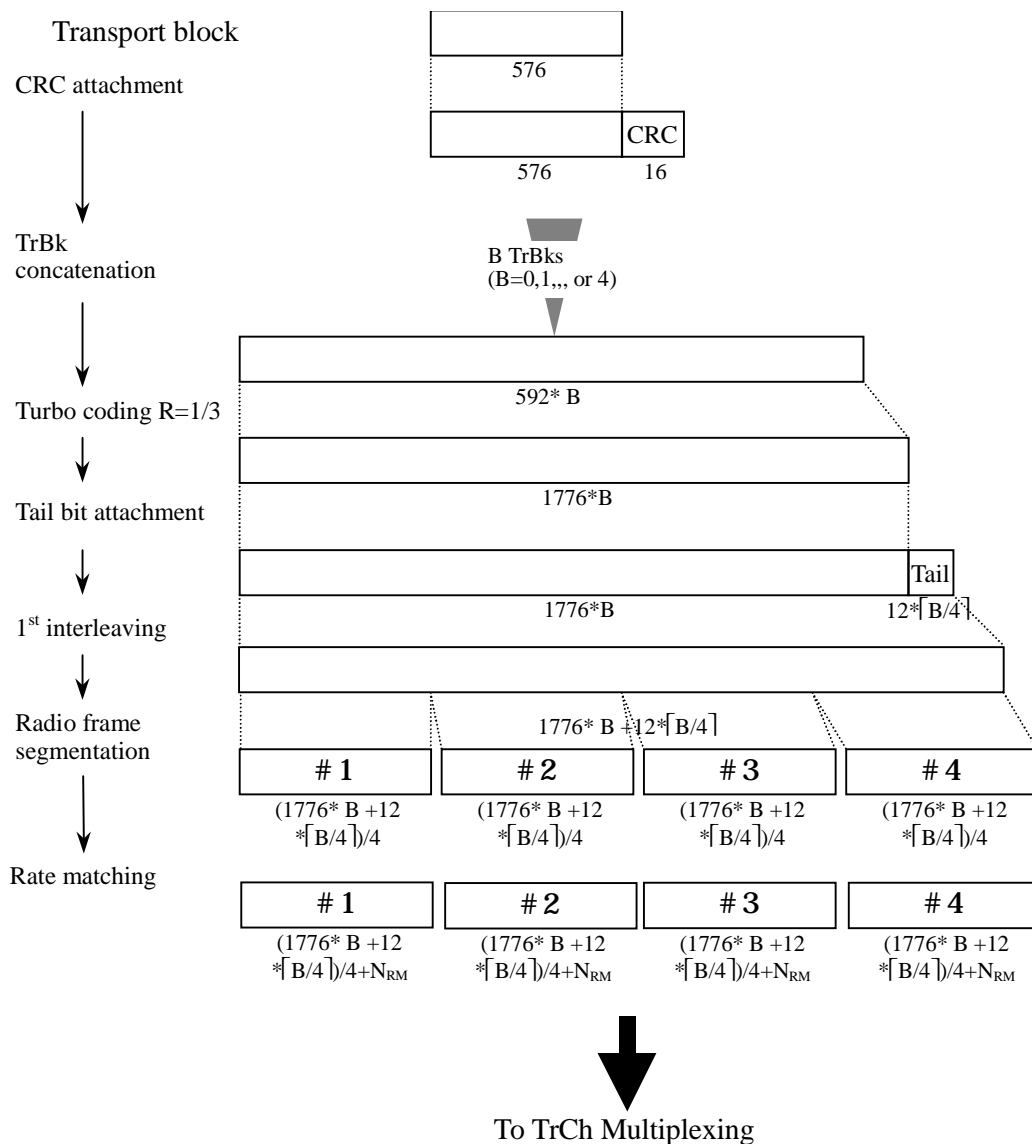
Figure 24: Channel coding and multiplexing example for 12.2 kbps data

4.2.1.4.1.3 Example of 28.8/57.6 kbps data

NOTE: This example can be applied to Modem or FAX.

**Table XX: Parameters for 28.8/57.6 kbps data**

The number of TrChs		1
Transport block size		576 bits
Transport block set size	28.8 kbps	576*B bits (B=0, 1, 2)
	57.6 kbps	576*B bits (B=0, 1, 2, 3, 4)
CRC		16 bits
Coding		Turbo coding, coding rate = 1/3
TTI		40 ms



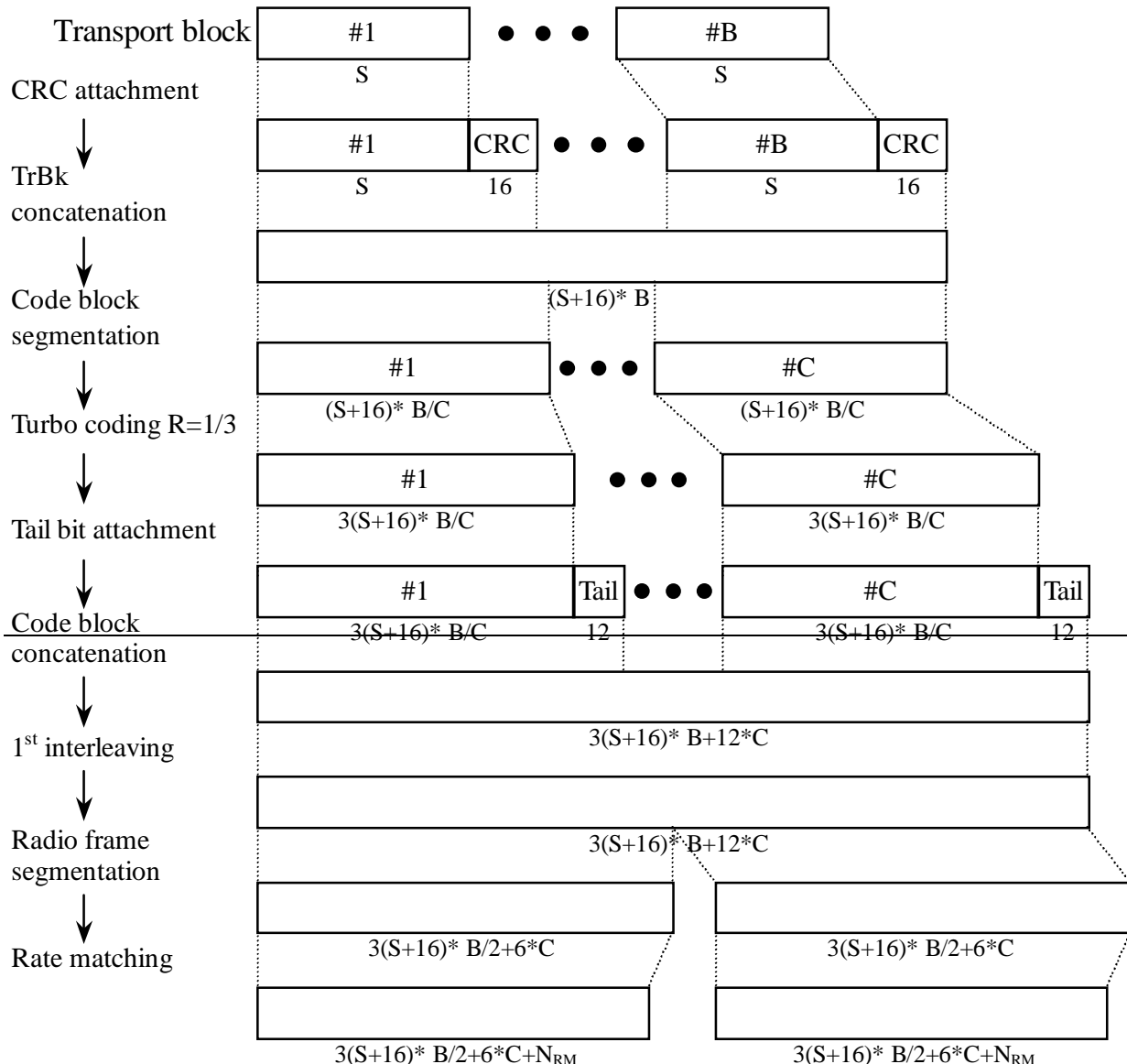
**Figure XX: Channel coding and multiplexing example for 28.8/57.6 kbps data**


## 4.2.1.4.1.34 Example of 64/128/384-144 kbps packet data

NOTE: In this example it is assumed, that maximum data rate of RLC payload is 64/128/144 kbps, and MAC and RLC overhead in a transport block is 16 bits.

**Table 21: Parameters for 64/128/144/384 kbps packet data**

The number of TrChs		1
Transport block size		336 bits
Transport block	64 kbps	1280 bits
Size: S	128 kbps	2560 bits
	384 kbps	3840 bits
Transport block	64 kbps	1280 <del>336</del> *B bits (B = 0, 1, 2, 4)
set size	128 kbps	2560 <del>336</del> *B bits (B = 0, 1, 2, 4, 8)
	384-144 kbps	3840 <del>336</del> *B bits (B = 0, 1, 2, 4, 8, 9)
Code block	64 kbps	4
Segmentation: C	128 kbps	4
	384 kbps	4 (B = 0, 1) or 2 (B = 2)
CRC		16 bits
Coding		Turbo coding, coding rate = 1/3
TTI		20 ms



  
 To TrCh Multiplexing

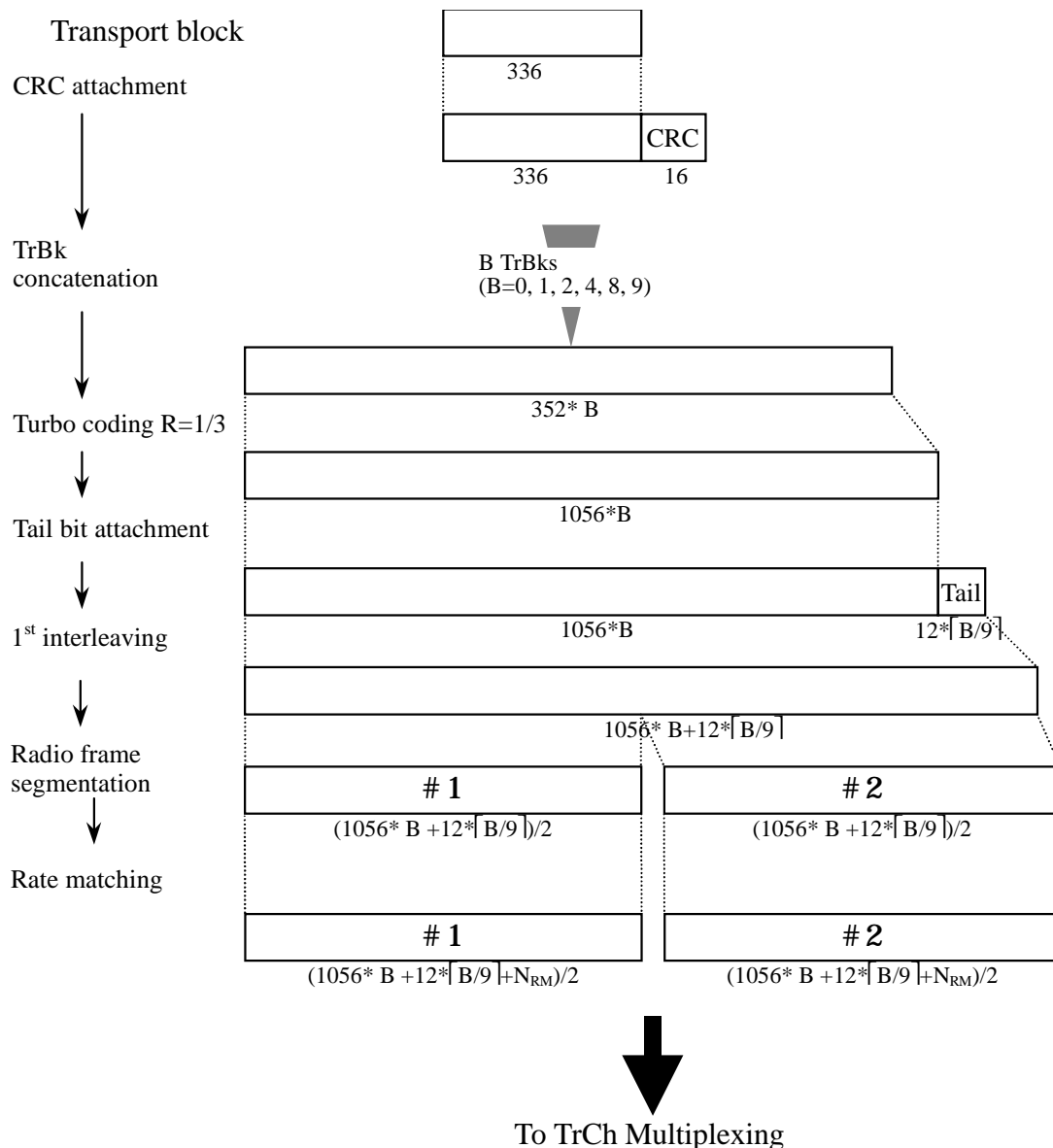


Figure 25: Channel coding and multiplexing example for 64/128/384-144 kbps packet data

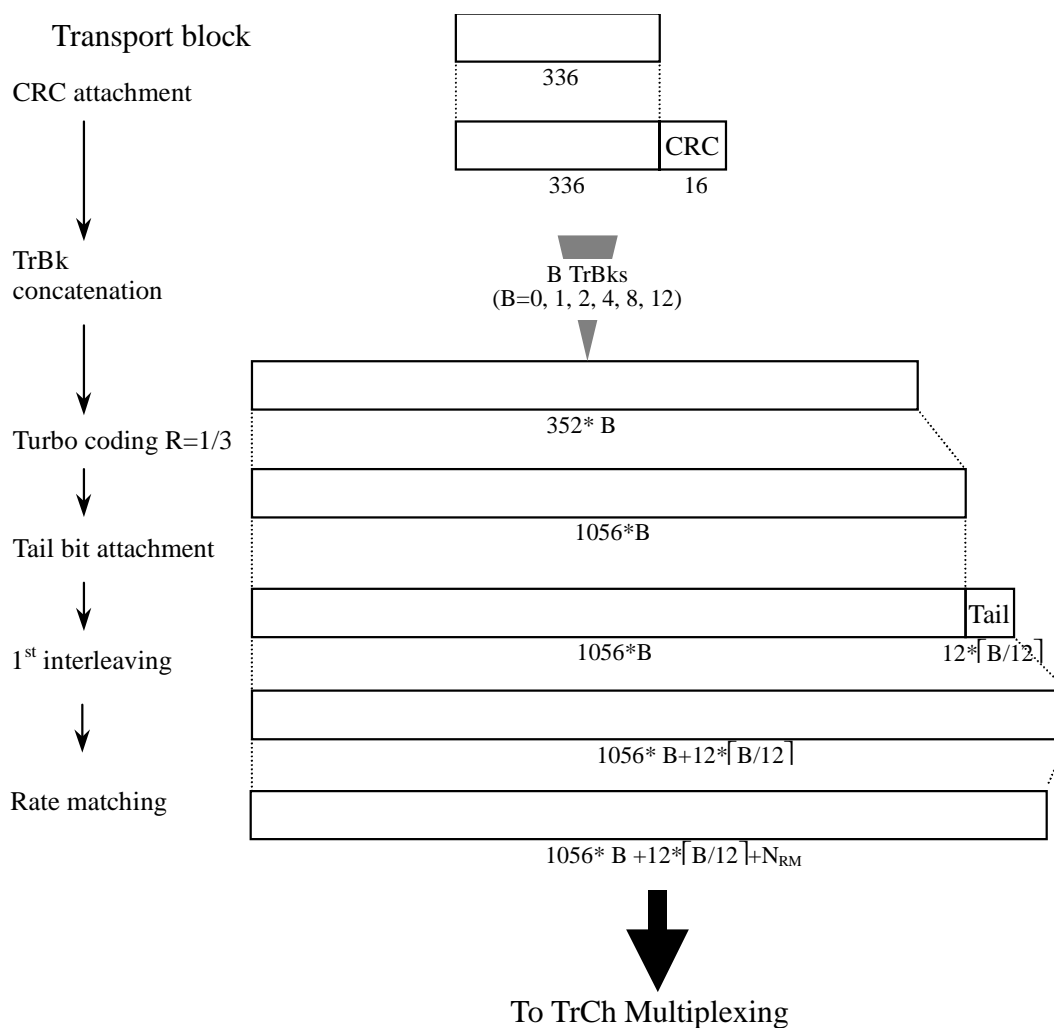


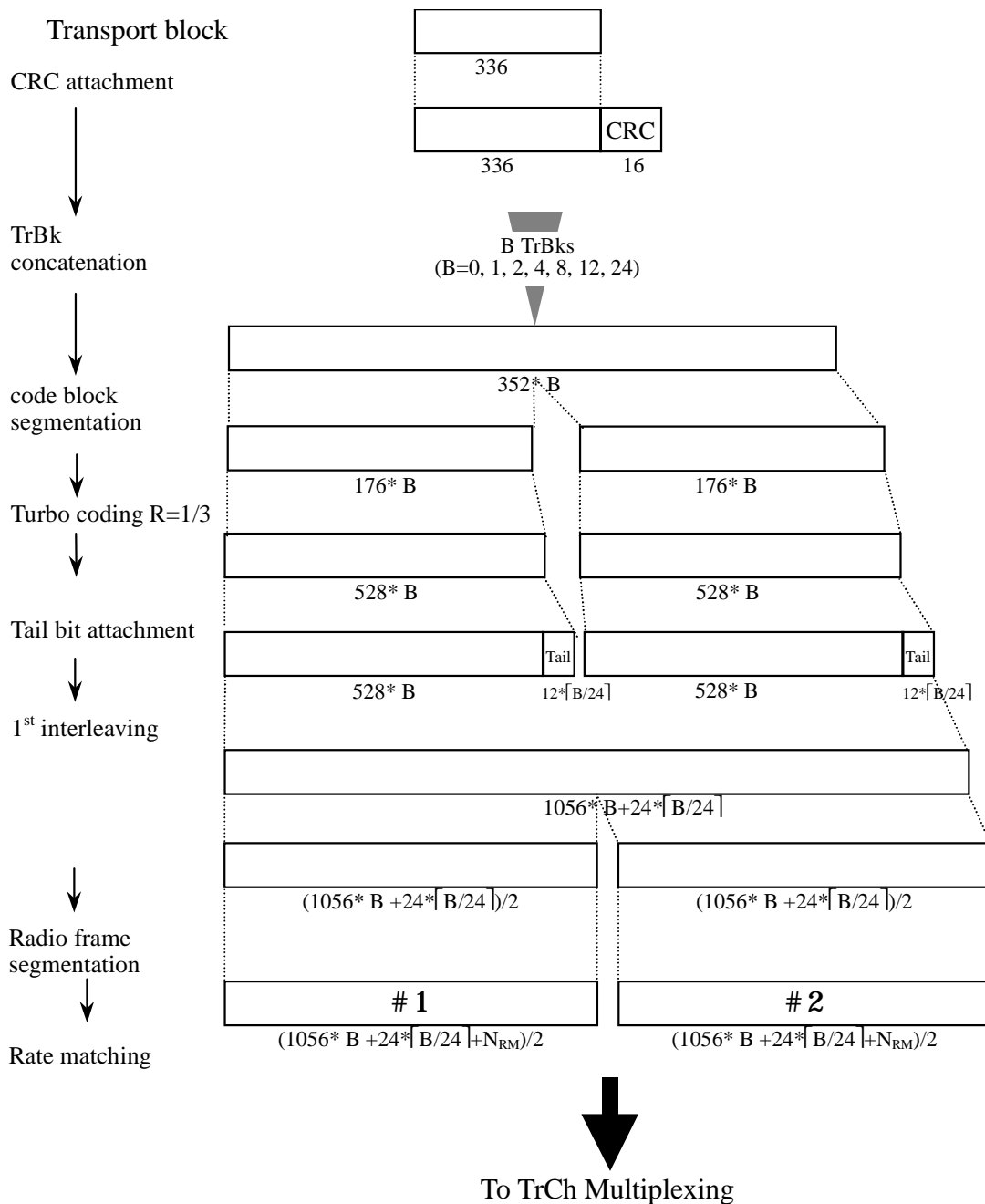
## 4.2.1.4.1.4 Example of 384 kbps packet data

NOTE: In this example it is assumed, that the maximum data rate of RLC payload is 384 kbps, and MAC and RLC overhead in a transport block is 16 bits.

**Table 21: Parameters for 384 kbps packet data**

The number of TrChs	1
Transport block size	336 bits
Transport block set size	$336 \cdot B$ bits ( $B = 0, 1, 2, 4, 8, 12$ for TTI=10ms, $B=0,1,2,4,8,12,24$ for TTI=20ms)
CRC	16 bits
Coding	Turbo coding, coding rate = $1/3$
TTI	10 or 20 ms

**Figure 25: Channel coding and multiplexing example for 384 kbps packet data in case of TTI=10ms**



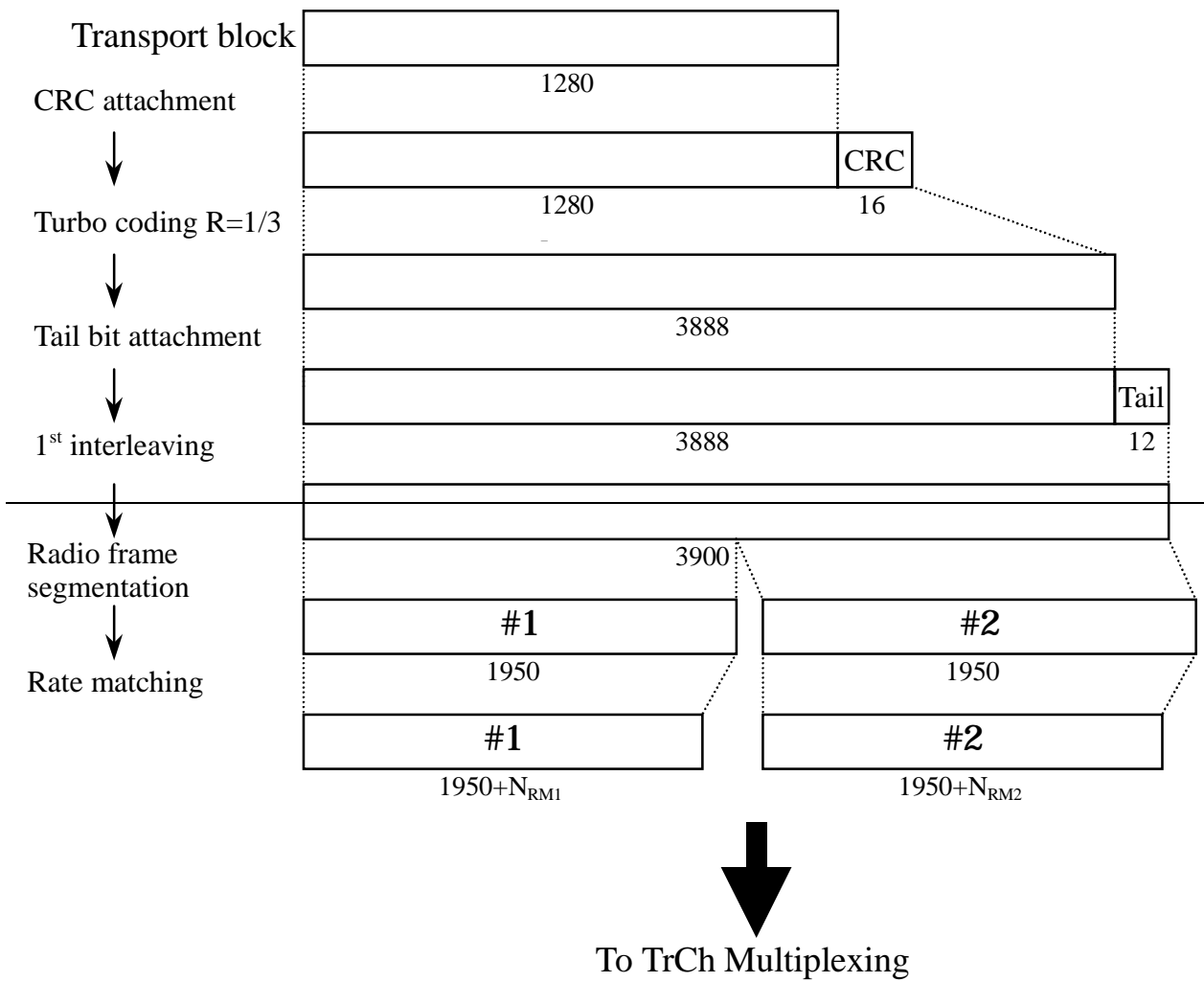
**Figure 25: Channel coding and multiplexing example for 384 kbps packet data in case of TTI=20ms**

## 4.2.1.4.1.4 Example for 64 kbps data

NOTE: This example can be applied to ISDN service.

**Table 22: Parameters for 64 kbps data**

The number of TrChs	1
Transport block size	<del>1280</del> 640 bits
Transport block set size	<del>1280</del> 4*640 bits
CRC	16 bits
Coding	Turbo coding, coding rate = 1/3
TTI	<del>20</del> 40 ms



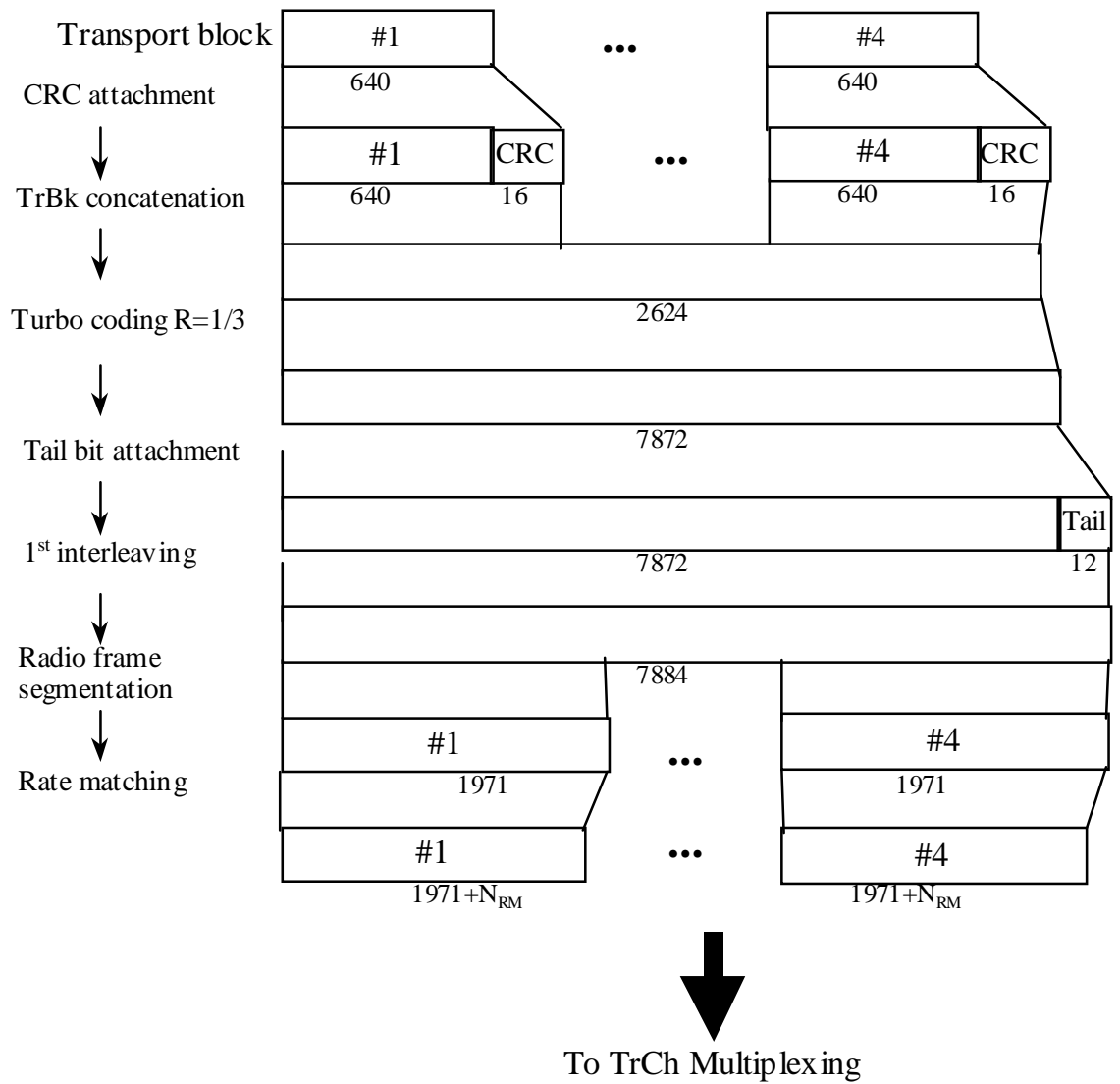


Figure 26: Channel coding and multiplexing example for 64 kbps data

4.2.1.4.2 TrCH multiplexing -> Physical channel mapping

4.2.1.4.2.1 Example for Stand-alone mapping of 2.4 kbps data

NOTE: This example can be applied to Stand-alone mapping of DCCH.

Table 23 shows example of physical channel parameters for Stand-alone mapping of 2.4 kbps data.

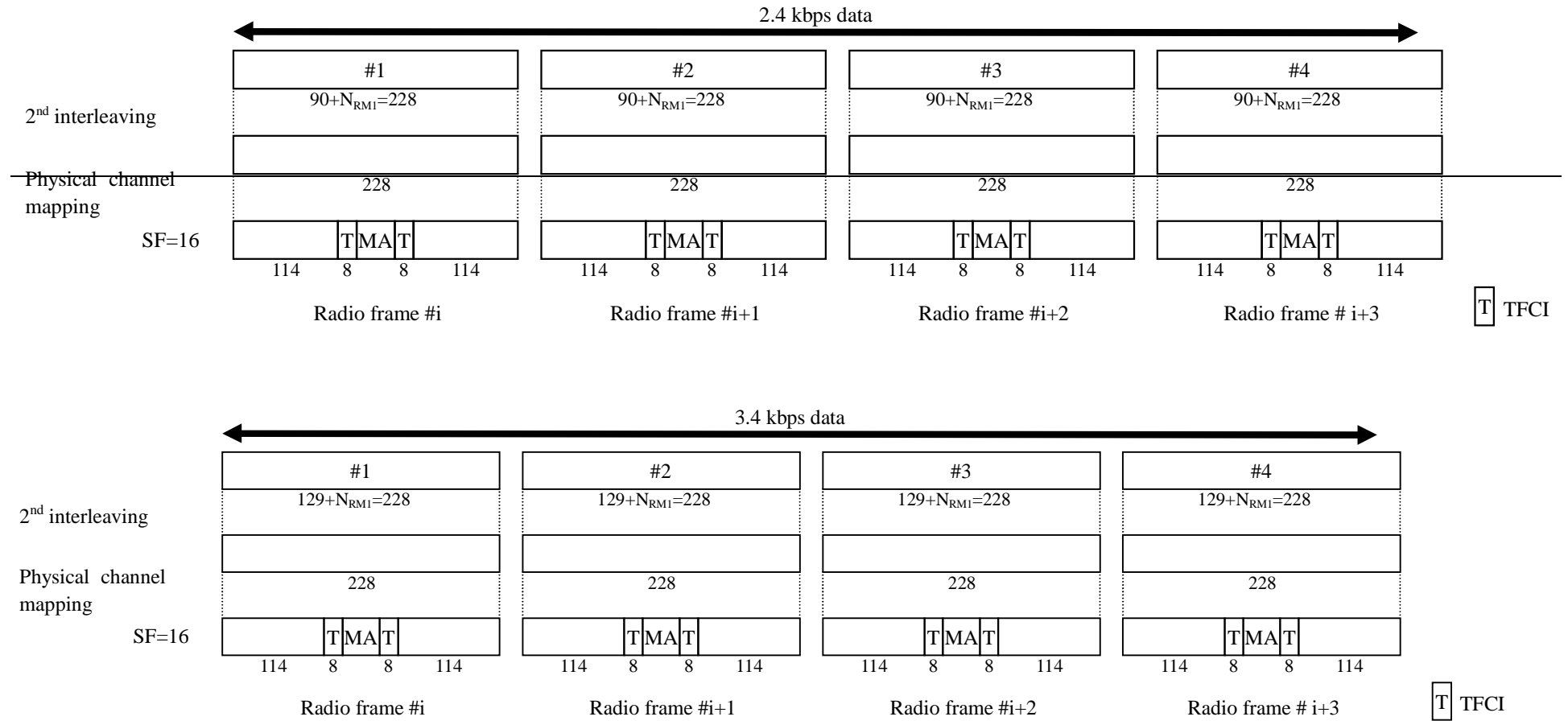


Figure 27: Channel coding and multiplexing example for Stand-alone mapping of 2.4 kbps data

**Table 23: Physical channel parameters for Stand-alone mapping of 23.4 kbps data**

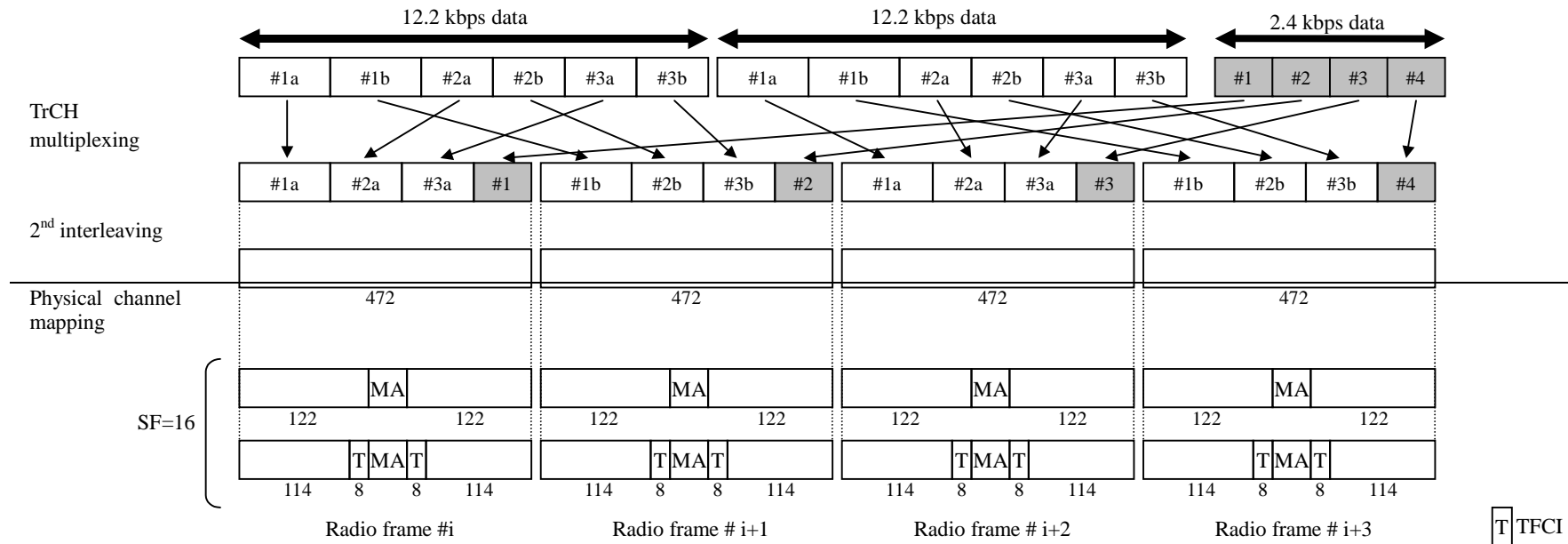
Midamble	512 chips
Codes and time slots	SF16 x 1 code x 1 time slot
TFCI	16 bits per user
TPC	0 bit

4.2.1.4.2.2 Example for multiplexing of 12.2 kbps data and 23.4 kbps data

NOTE: This example can be applied to multiplexing AMR speech and DCCH.



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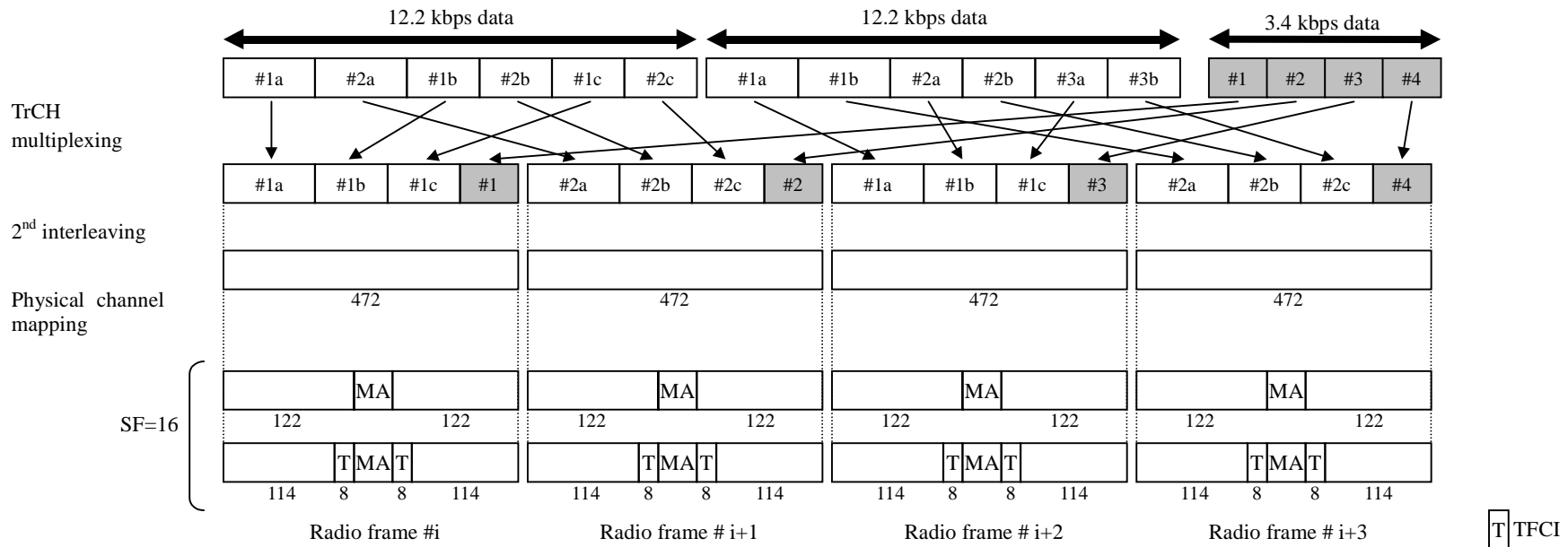


Figure 28: Channel coding and multiplexing example for multiplexing of 12.2 kbps data and 3.4 kbps data

Table 24: Physical channel parameters for multiplexing of 12.2 kbps data and 3.4 kbps data

Midamble	512 chips
Codes and time slots	SF16 x 2 code x 1 time slot
TFCI	16 bits per user
TPC	0 bit

4.2.1.4.2.3 Example for multiplexing of 28.8/57.6 kbps data 3.4 kbps data

NOTE: This example can be applied to multiplexing of Modem/FAX and DCCH.

Table XX shows example of physical channel parameters for multiplexing of 28.8/57.6 kbps data and 3.4 kbps data.

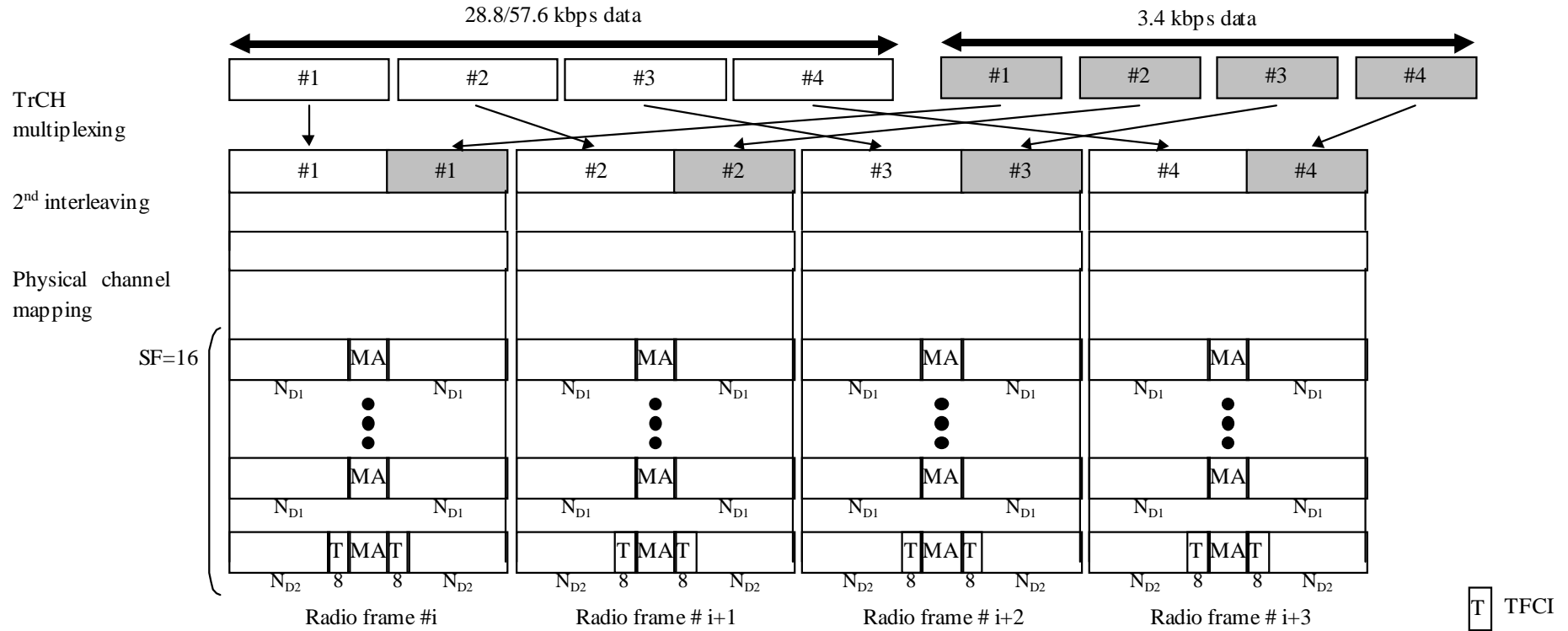


Figure 29: Channel coding and multiplexing example for multiplexing 28.8/57.6 kbps data and 3.4 kbps data

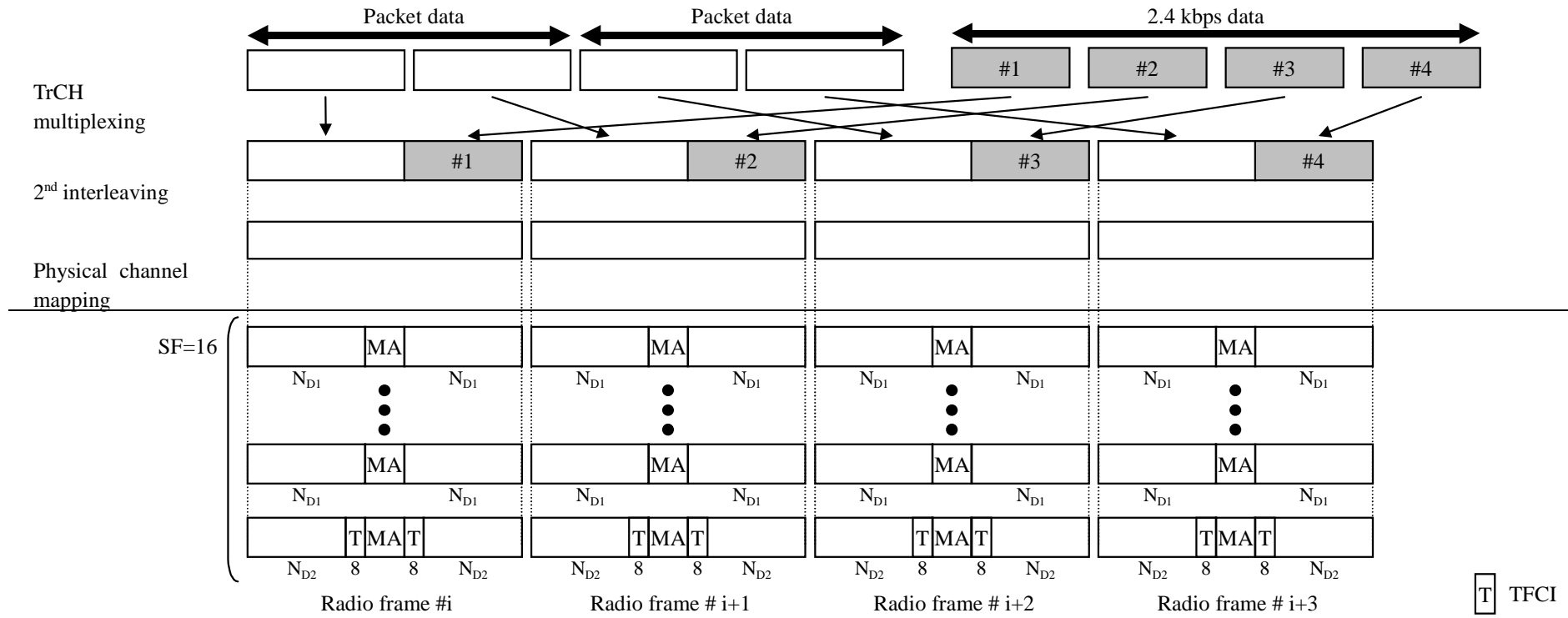
**Table XX: Physical channel parameters for multiplexing of 28.8/57.6 kbps packet data and 3.4 kbps data**

Midamble	28.8/57.6 kbps	512 chips
$N_{D1}, N_{D2}$	28.8/57.6 kbps	122 bits, 114 bits
Code & time	28.8 kbps	SF16 x 2 codes x 1 time slot
slots	57.6 kbps	SF16 x 4 codes x 1 time slot
TFCI		16 bits per user
TPC		0 bit

4.2.1.4.2.3 Example for multiplexing of 64/128/144/384 kbps packet data and 32.4 kbps data

NOTE: This example can be applied to multiplexing 64/128/144/384 kbps packet data and DCCH.

Table 25 shows example of physical channel parameters for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data.



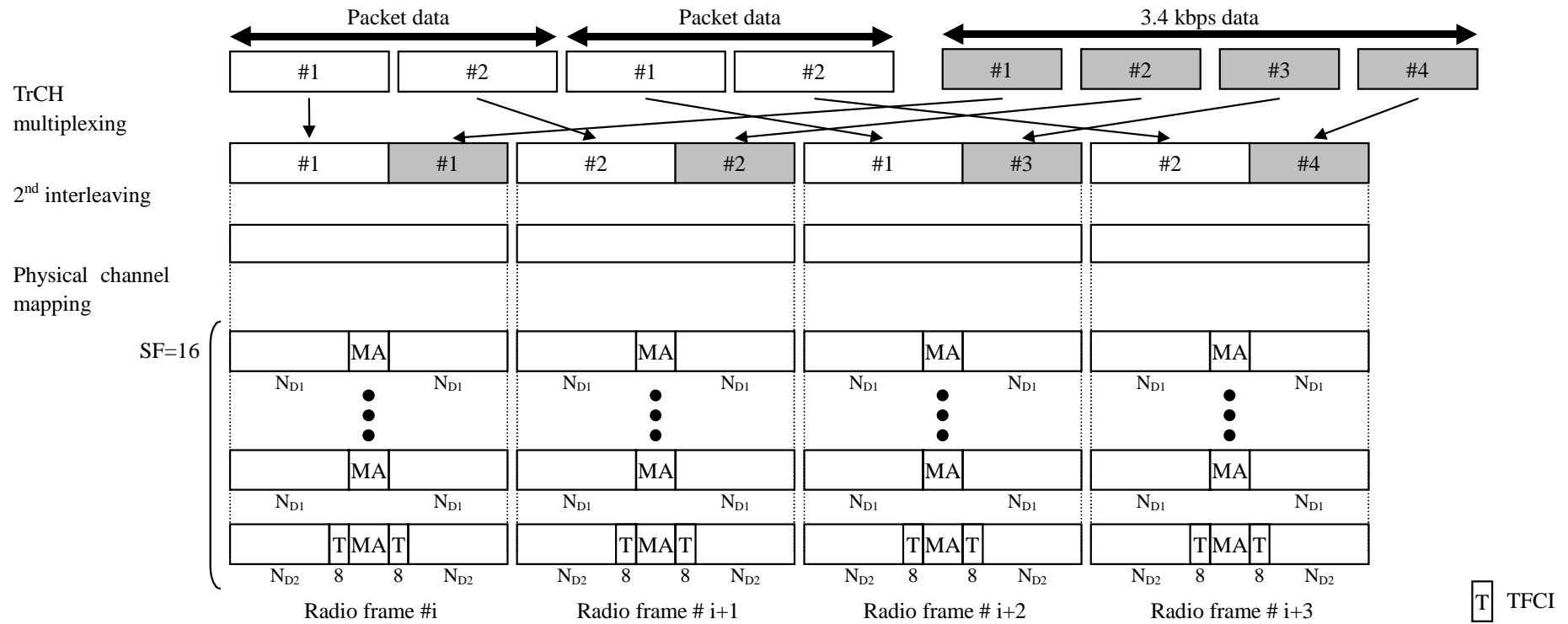


Figure 29: Channel coding and multiplexing example for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data

Table 25: Physical channel parameters for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data

Midamble	64 kbps	512 chips
	128 & 144 & 384 kbps	256 chips
$N_{D1}, N_{D2}$	64 kbps	122 bits, 114 bits
	128 & 144 & 384 kbps	138 bits, 130 bits
Code & time slots	64 kbps	SF16 x 5 codes x 1 time slot
	128 kbps	SF16 x 9 codes x 1 time slot
	144 kbps	SF16 x 9 codes x 1 time slot
	384 kbps	SF16 x 8 codes x 3 time slots
TFCI		16 bits per user
TPC		0 bit

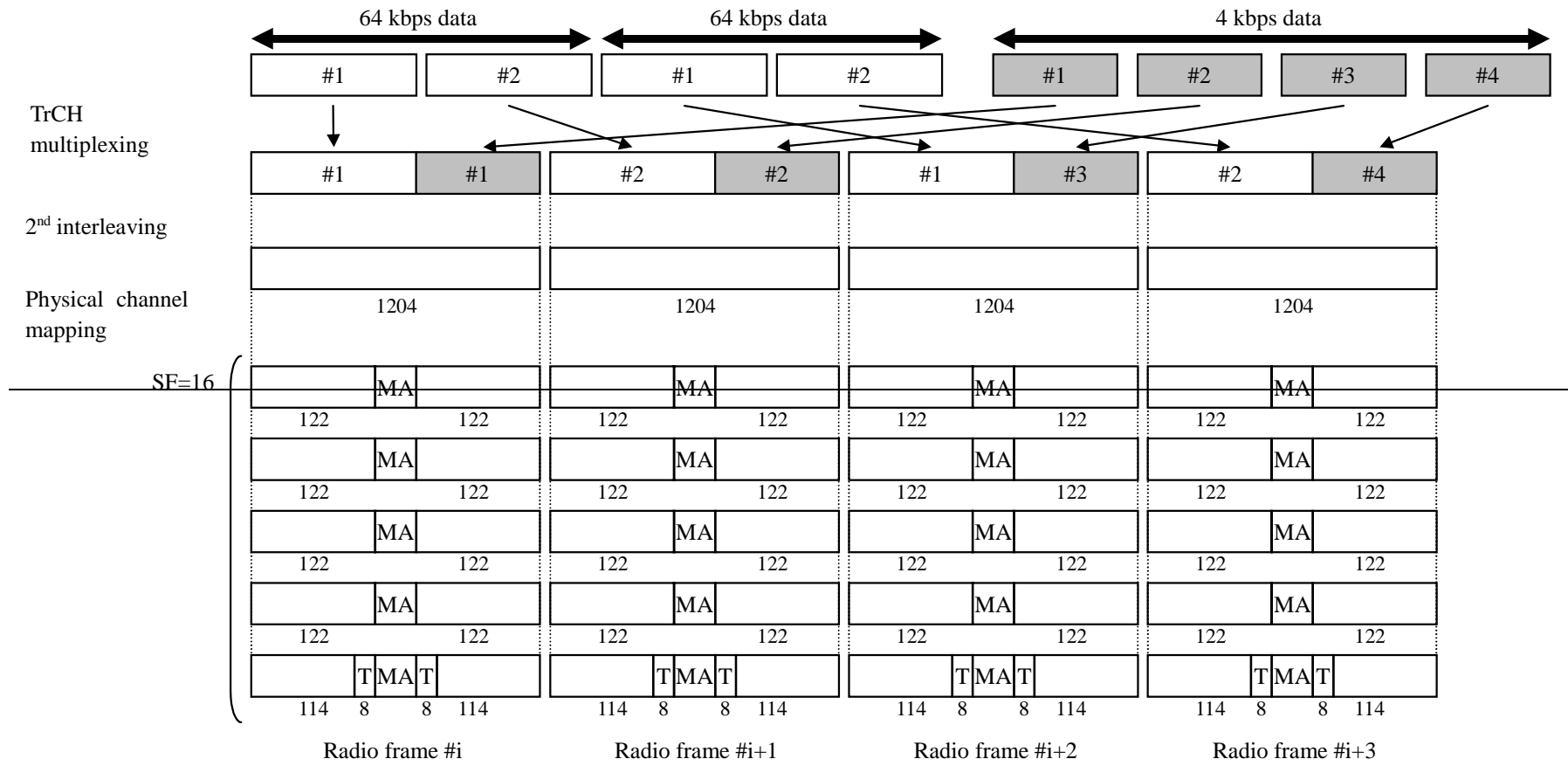
4.2.1.4.2.4 Example for multiplexing of 64 kbps data and ~~23.4~~ 32.4 kbps data

NOTE: This example can be applied to multiplexing ISDNs data and DCCH.

Table 26 shows example of physical channel parameters for multiplexing of 64/128/384 kbps ~~packet~~ data and 32.4 kbps data.



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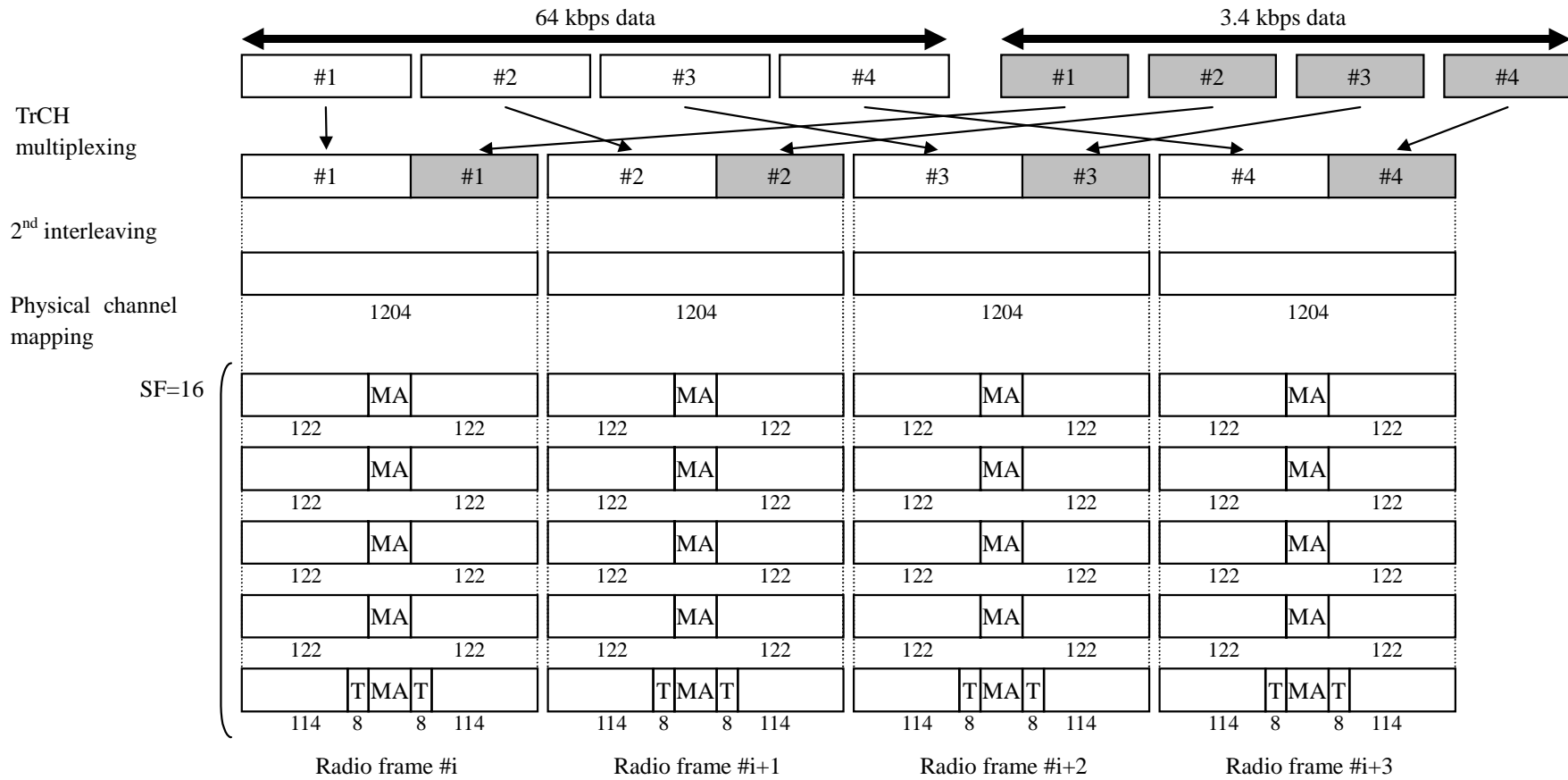


Figure 30: Channel coding and multiplexing example for multiplexing of ~~64/128/384~~ kbps packet data and ~~32~~.4 kbps data

Table 26: Physical channel parameters for multiplexing of ~~64/128/384~~ kbps packet data and ~~23~~.4 kbps data

Midamble	512 chips
Code & time slots	SF16 x 5 codes x 1 time slot
TFCI	16 bits per user
TPC	0 bit

4.2.1.4.2.4 Example for multiplexing of 12.2 kbps data, 64/128/144/384 kbps packet data and 3.4 kbps data

NOTE: This example is corresponding to multiplexing of AMR speech, 64/128/144/384 kbps packet and DCCH.

Table 26 shows example of physical channel parameters for multiplexing of 12.2 kbps data, 64/128/144/384 kbps packet data and 3.4 kbps data.

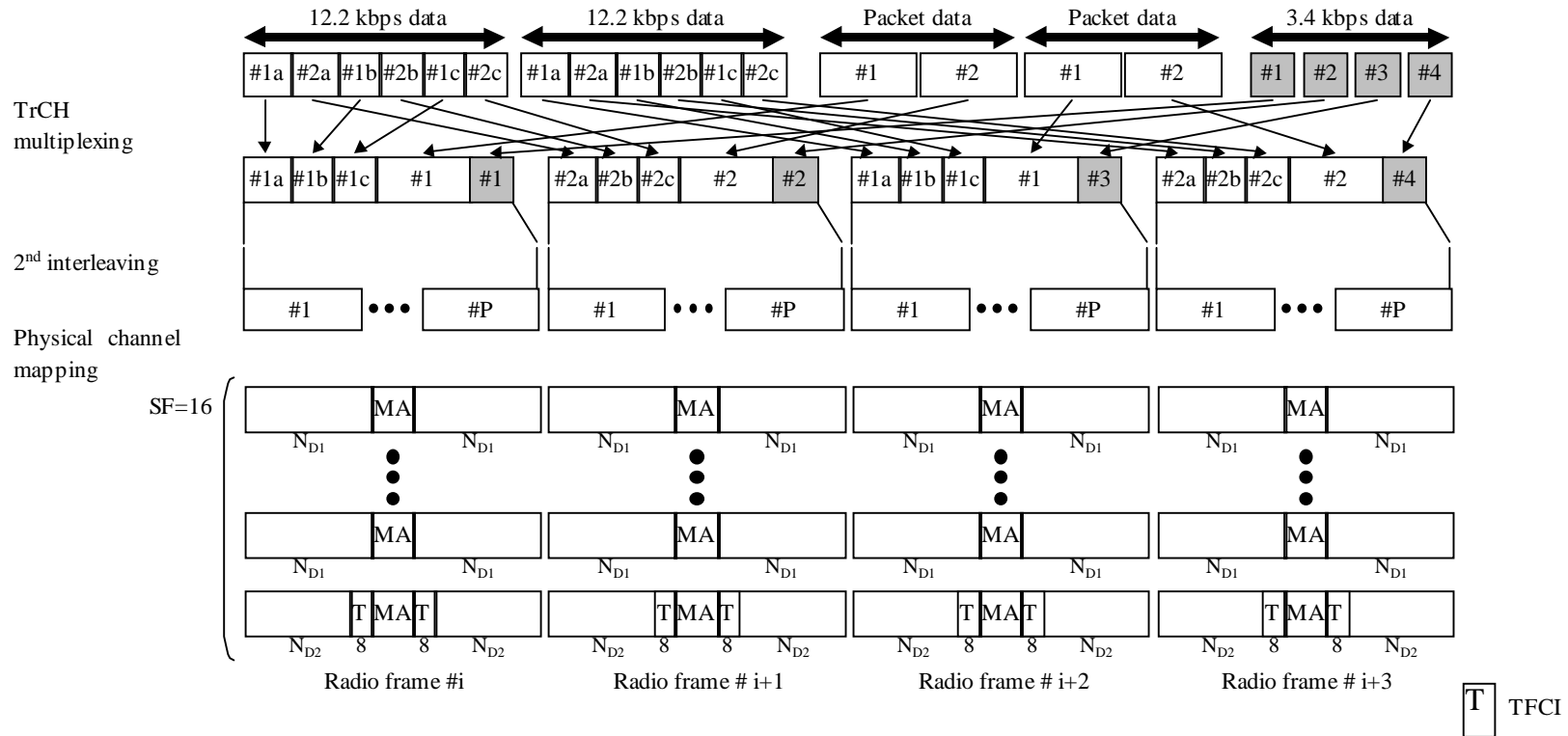


Figure 30: Channel coding and multiplexing example for multiplexing of 12.2 kbps data, 64/128/144/384 kbps packet data and 3.4 kbps data

Table 26: Physical channel parameters for multiplexing of 12.2 kbps data, 64/128/144/384 kbps packet data and 3.4 kbps data

Data rate (kbps)	No. of timeslots	No. of physical channels with SF16 per used TS	Midamble length	$N_{TFCI}$	$N_{TPC}$

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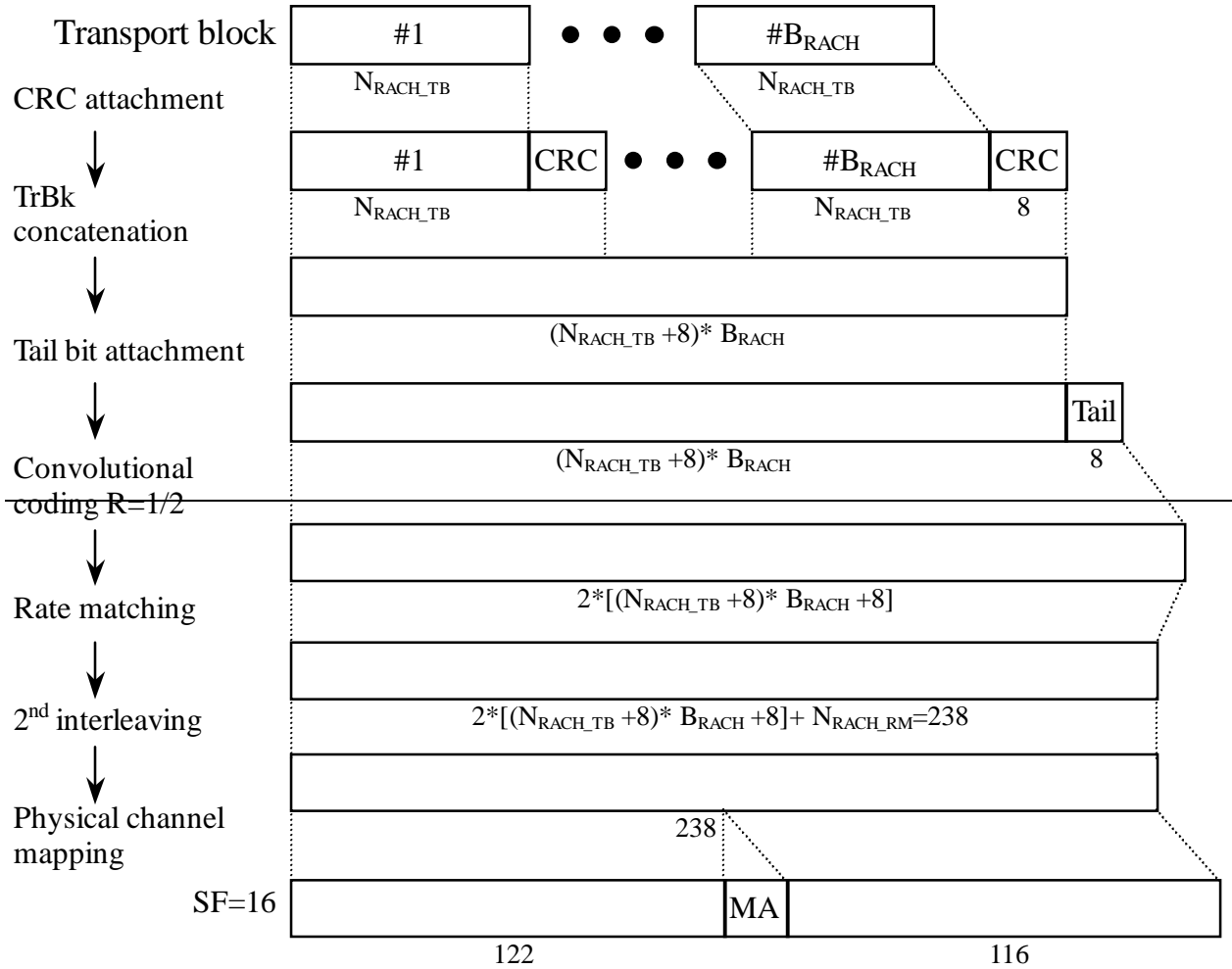
<u>64</u>	<u>1</u>	<u>5</u>	<u>512 chips</u>	<u>16</u>	<u>0</u>
<u>128</u>	<u>1</u>	<u>8</u>	<u>256 chips</u>	<u>16</u>	<u>0</u>
<u>144</u>	<u>1</u>	<u>9</u>	<u>256 chips</u>	<u>16</u>	<u>0</u>
<u>384</u>	<u>3</u>	<u>8</u>	<u>256 chips</u>	<u>16</u>	<u>0</u>

## 4.2.2 Uplink

### 4.2.2.1 RACH

**Table 27: Parameters for RACH**

Transport block size	$N_{RACH}=168$ or 360 bits
CRC	8-16 bits
Coding	CC, coding rate = 1/2
TTI	10 ms
Midamble	512 chips
Codes and time slots	SF = 16 x 1 x 1 time slot <u>or</u> SF = 8 x 1 x 1 time slot
TFCI	0 bit
TPC	0 bit



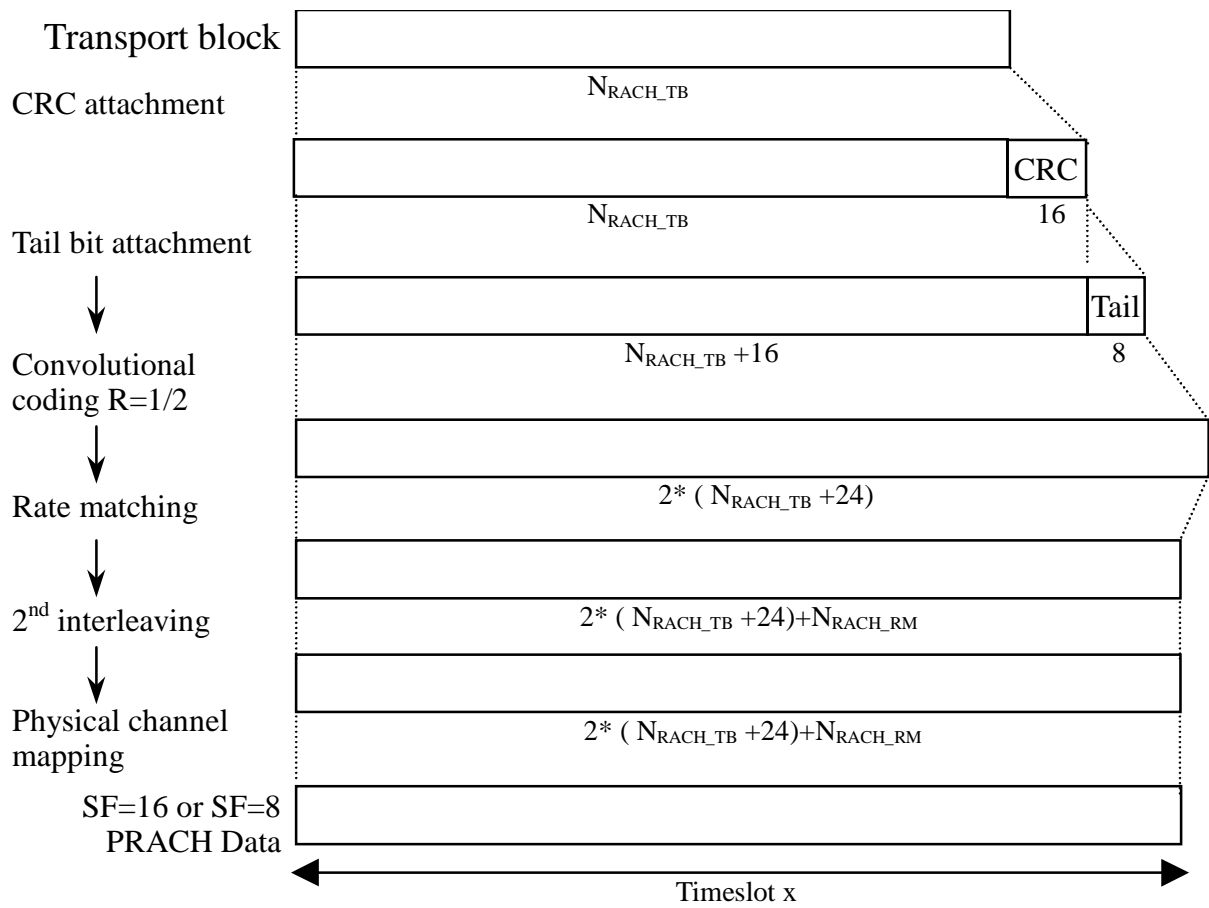


Figure 31: Channel coding and multiplexing example for PRACH

#### 4.2.2.2 Example for DCH

##### 4.2.2.2.1 DCH-> Radio frame segmentation

See 4.2.1.4.2.



#### 4.2.2.2.2 TrCH multiplexing -> Physical channel mapping

##### 4.2.2.2.2.1 Example for Stand-alone mapping of 2.4 kbps data

NOTE: This example can be applied to Stand-alone mapping of DCCH.

~~Table 28 shows example of physical channel parameters for Stand-alone mapping of 2.4 kbps data.~~

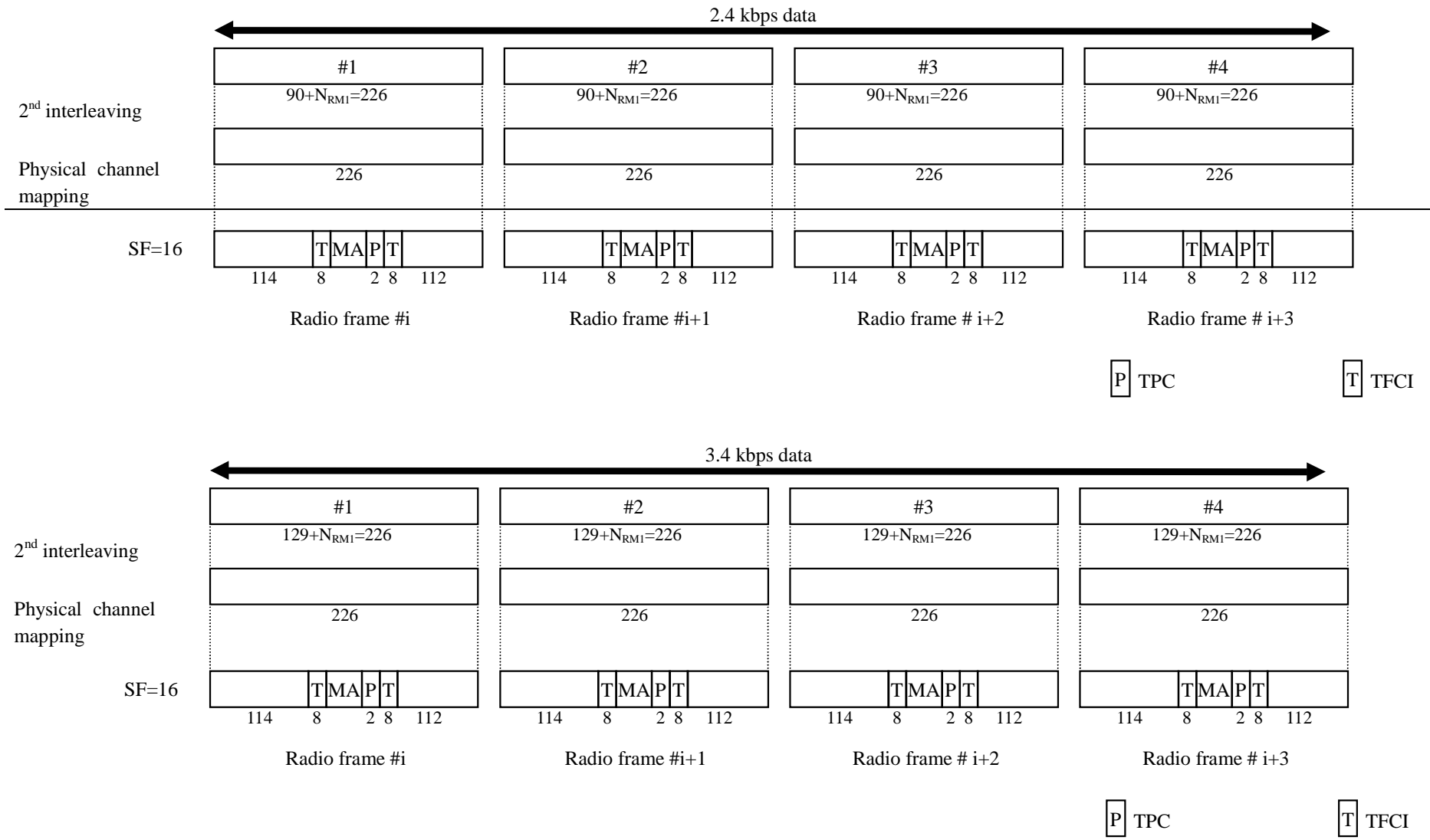


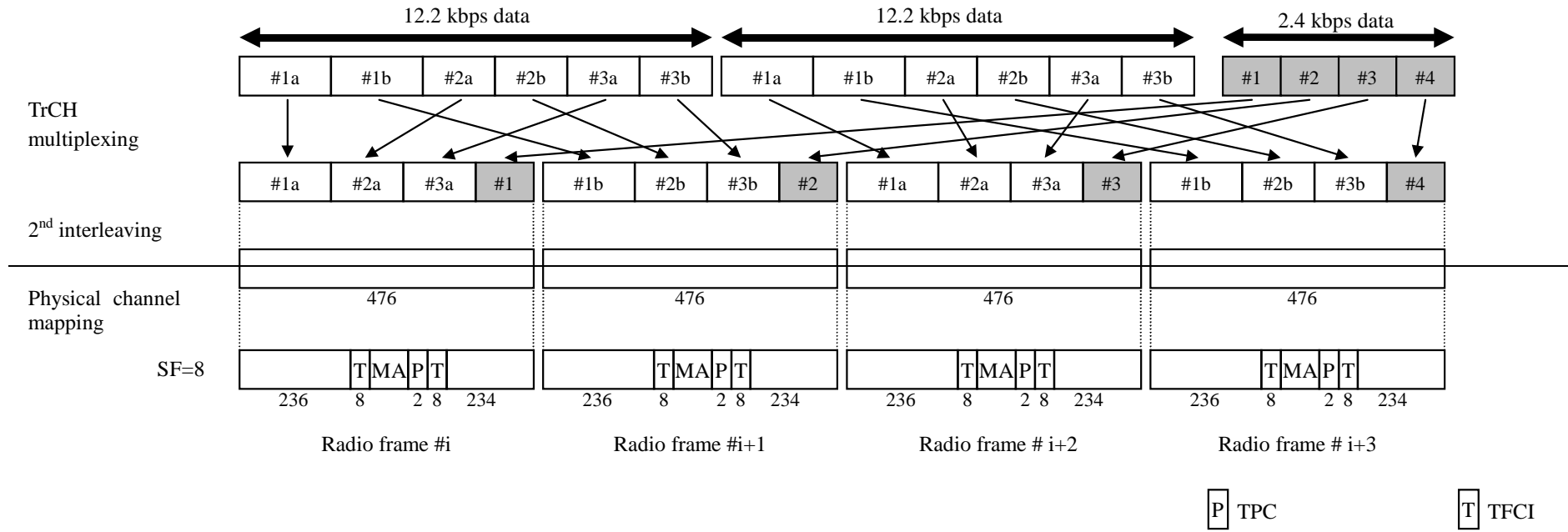
Figure 32: Channel coding and multiplexing example for Stand-alone mapping of 2.4 kbps data

**Table 28: Physical channel parameters for Stand-alone mapping of 2.4 kbps data**

Midamble	512 chips
Codes and time slots	SF16 x 1 code x 1 time slot
TFCI	16 bits per user
TPC	2 bit

4.2.2.2.2.2 Example for multiplexing of 12.2 kbps data and 23.4 kbps data

NOTE: This example can be applied to multiplexing AMR speech and DCCH.



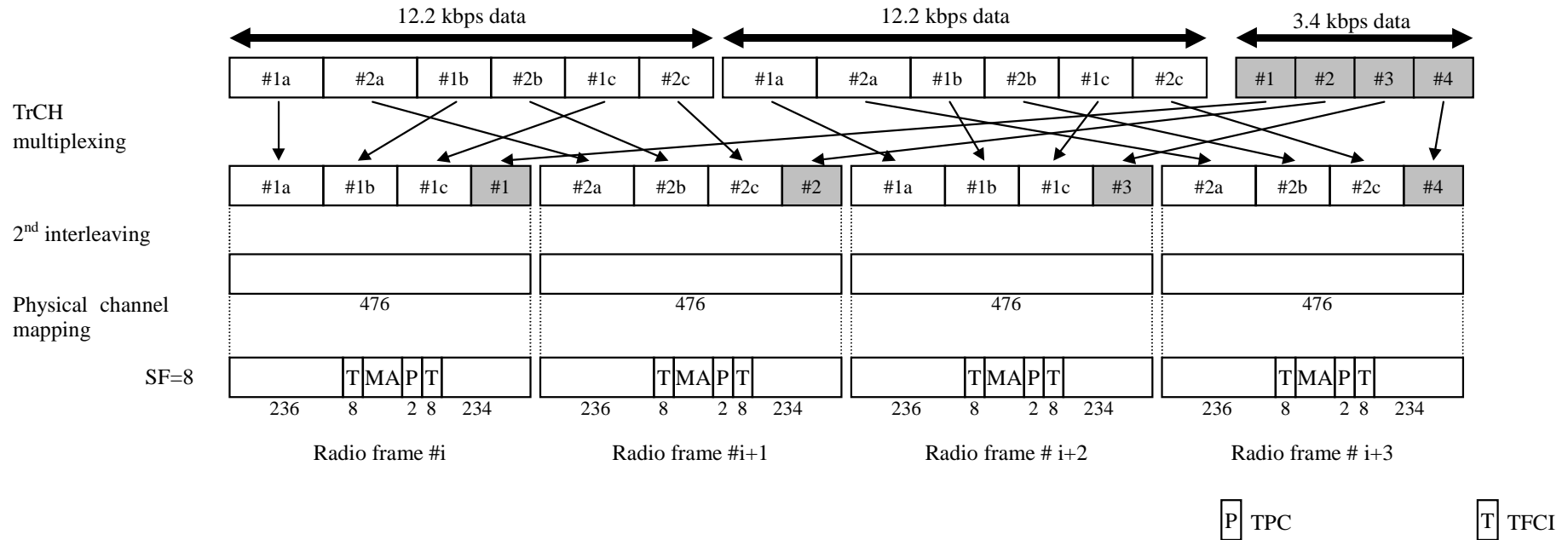


Figure 33: Channel coding and multiplexing example for multiplexing of 12.2 kbps data and 3.4 kbps data

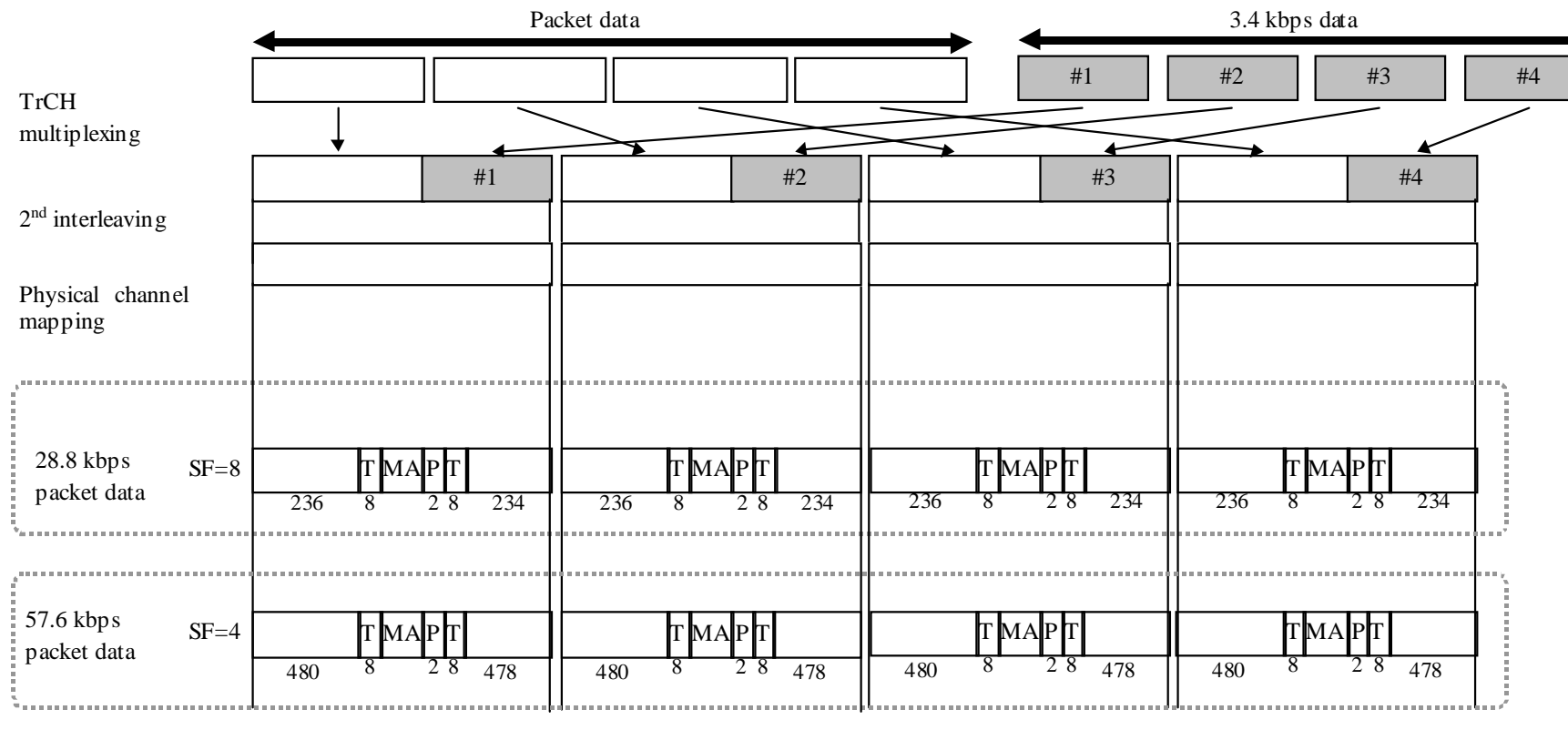
Table 29: Physical channel parameters for multiplexing of 12.2 kbps data and 3.4 kbps data

Midamble	512 chips
Codes and time slots	SF8 x 1 code x 1 time slot
TFCI	16 bits per user
TPC	2 bit

## 4.2.2.2.2.3 Example for multiplexing of 28.8/57.6 kbps data and 3.4 kbps data

NOTE: This example can be applied to multiplexing of Modem/FAX and DCCH.

Table 30 shows example of physical channel parameters for multiplexing of 28.8/57.6 kbps data and 3.4 kbps data.



**Figure 34: Channel coding and multiplexing example for multiplexing of 28.8/57.6 kbps data and 3.4 kbps data**

**Table 30: Physical channel parameters for multiplexing of 28.8/57.6 kbps data and 3.4 kbps data**

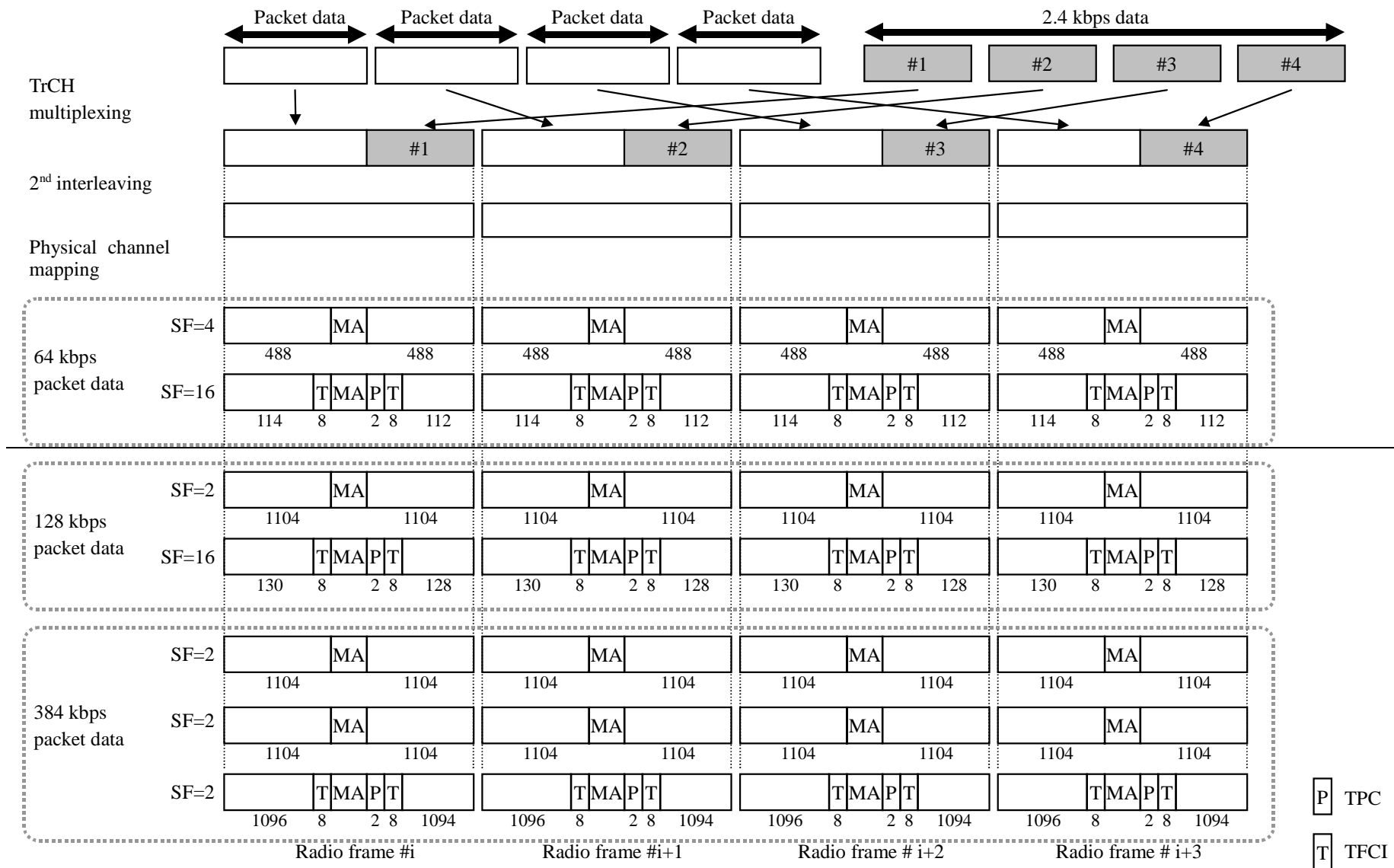
Midamble	<u>28.8/57.6 kbps</u>	<u>512 chips</u>
Codes & time slots	<u>28.8 kbps</u>	<u>(SF8 x 1 code) x 1 time slot</u>
	<u>57.6 kbps</u>	<u>(SF4 x 1 code) x 1 time slot</u>
TFCI		<u>16 bits per user</u>
TPC		<u>2 bit</u>



4.2.2.2.3 Example for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data

NOTE: This example can be applied to multiplexing 64/128/144/384 kbps packet data and DCCH.

Table 30 shows example of physical channel parameters for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data.



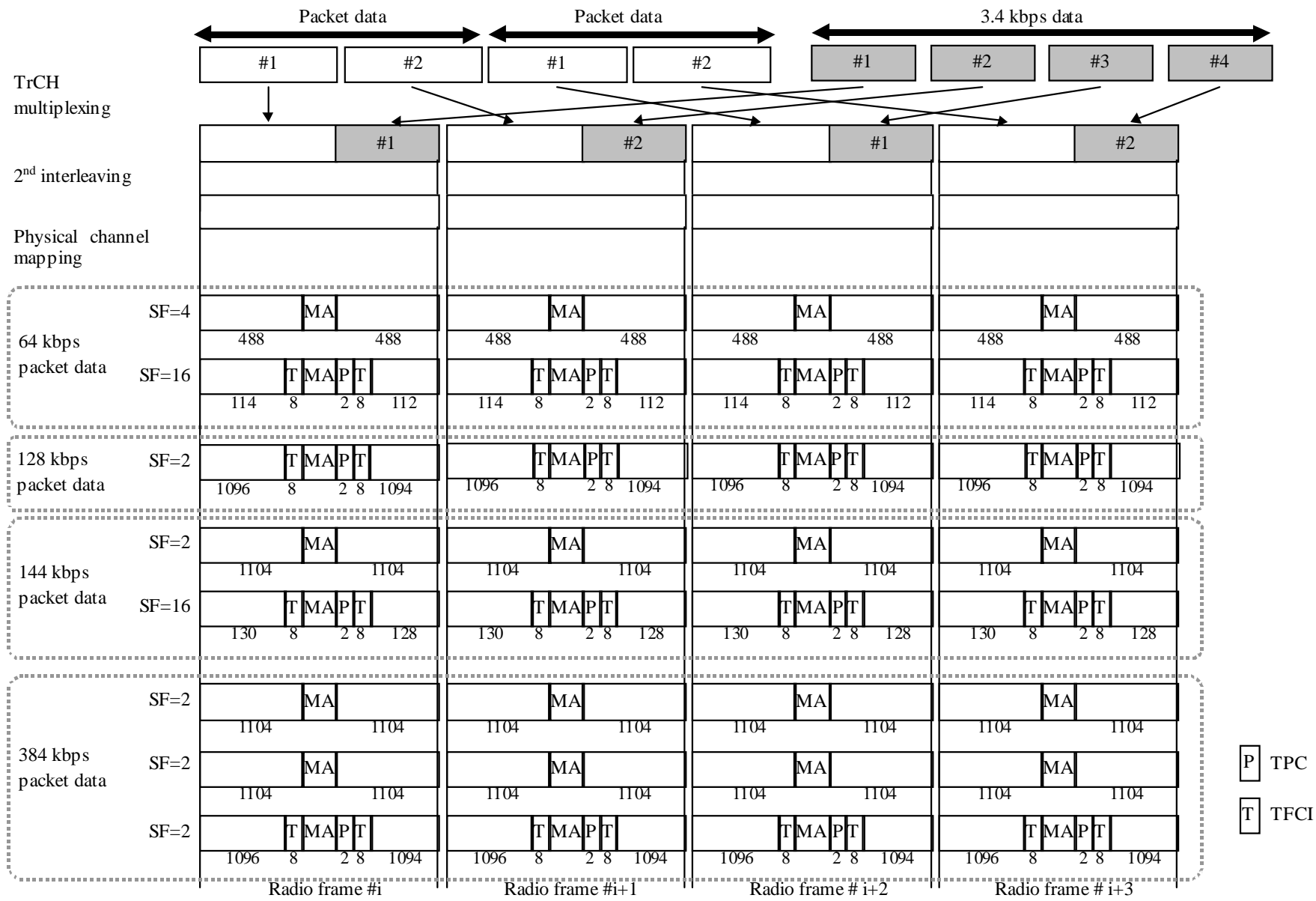


Figure 34: Channel coding and multiplexing example for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data

**Table 30: Physical channel parameters for multiplexing of 64/128/144/384 kbps packet data and 23.4 kbps data**

Midamble	64 kbps	512 chips
	128 & 144 & 384 kbps	256 chips
Codes & time slots	64 kbps	$\{(SF16 \times 1 \text{ code}) + (SF4 \times 1 \text{ code})\} \times 1 \text{ time slot}$
	128 kbps	$\{(SF16 \times 1 \text{ code}) + (SF2 \times 1 \text{ code})\} \times 1 \text{ time slot}$
	144 kbps	$\{(SF16 \times 1 \text{ code}) + (SF2 \times 1 \text{ code})\} \times 1 \text{ time slot}$
	384 kbps	SF2 x 1 code x 3 time slot
TFCI		16 bits per user
TPC		2 bit

NOTE: As an additional example, physical channels can also be mapped without using multicode per timeslot, e.g.:

for 64kbps:  $(SF16 \times 1 \text{ code} \times 1 \text{ timeslot}) + (SF4 \times 1 \text{ code} \times 1 \text{ timeslot})$

for 64kbps:  $(SF2 \times 1 \text{ code} \times 1 \text{ timeslot})$

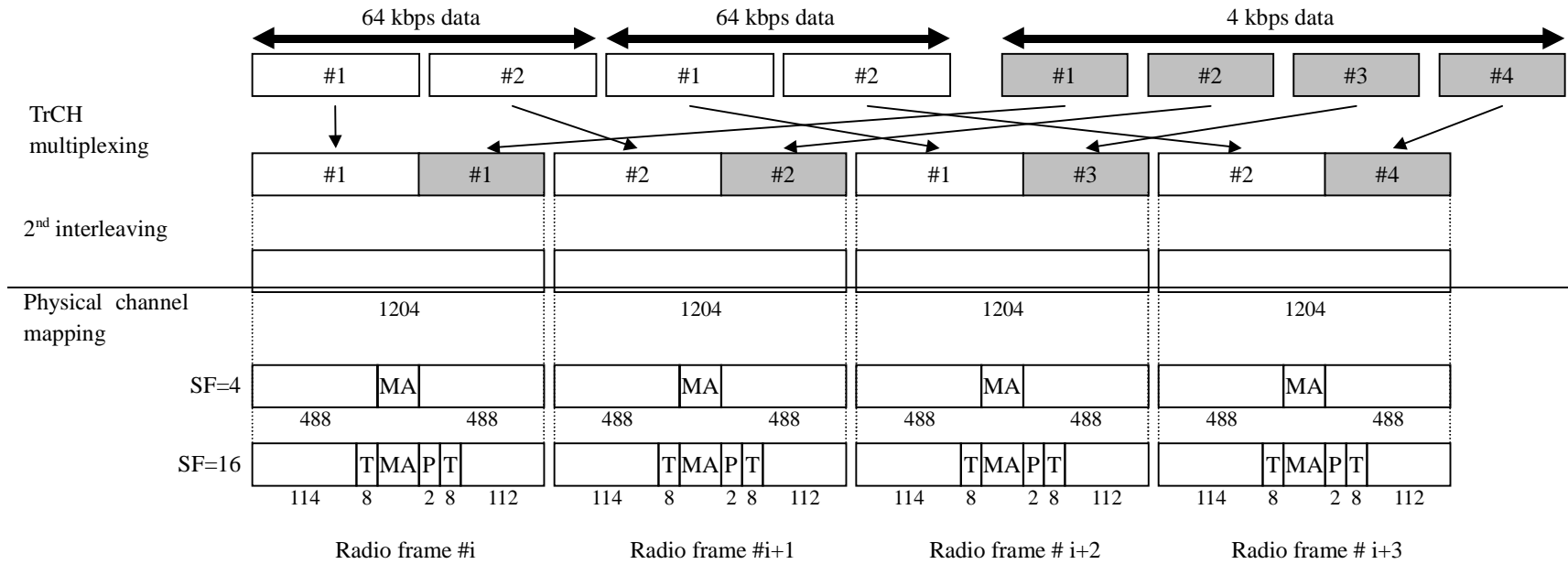
for ~~128kbps~~144kbps:  $(SF16 \times 1 \text{ code} \times 1 \text{ timeslot}) + (SF2 \times 1 \text{ code} \times 1 \text{ timeslot})$

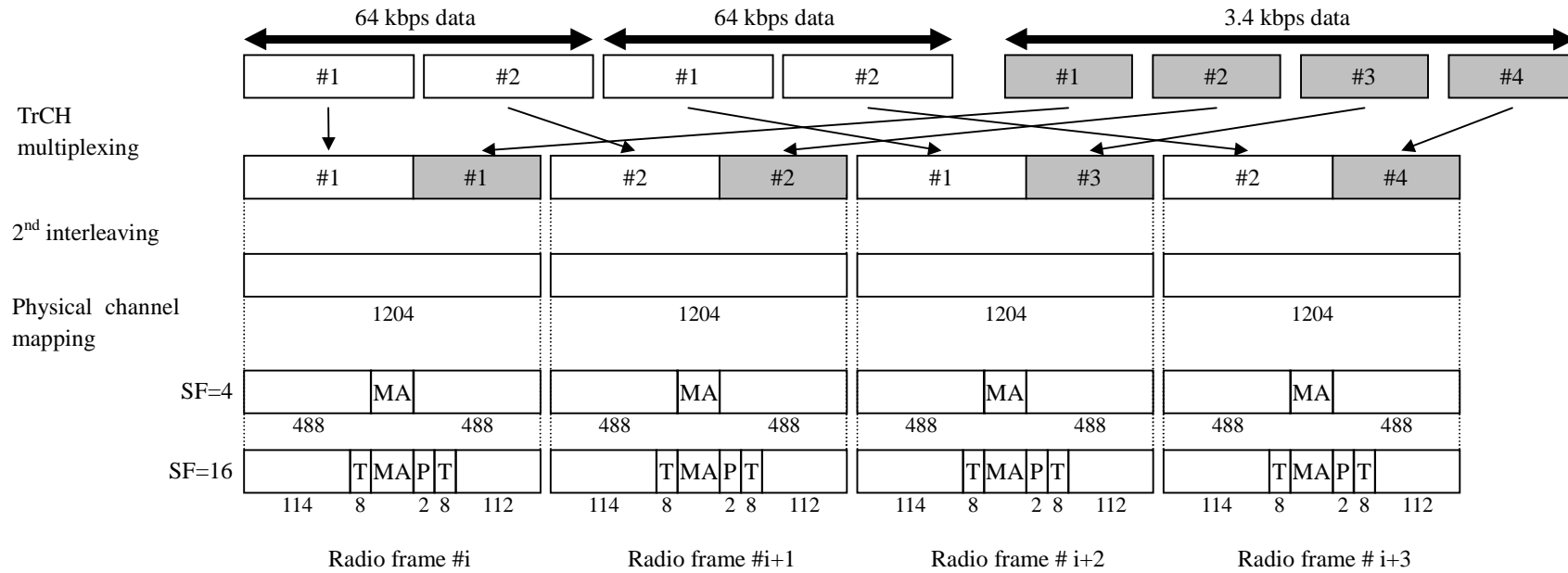
for ~~128kbps~~144kbps:  $(SF1 \times 1 \text{ code} \times 1 \text{ timeslot})$

#### 4.2.2.2.2.4 Example for multiplexing of 64 kbps data and ~~23~~ 23.4 kbps data

NOTE: This example can be applied to multiplexing ISDNs data and DCCH.

Table 31 shows example of physical channel parameters for multiplexing of ~~64/128/384~~ 64 kbps packet data and ~~23~~ 23.4 kbps data.





**Figure 35: Channel coding and multiplexing example for multiplexing of 64 kbps packet data and 23.4 kbps data**

**Table 31: Physical channel parameters for multiplexing of 64 kbps packet data and 23.4 kbps data**

Midamble	512 chips
Codes & time slots	{(SF16 x 1 code) + (SF4 x 1 code)} x 1 time slot
TFCI	16 bits per user
TPC	2 bit

NOTE: As an additional example, physical channels can also be mapped without using multicode per timeslot, e.g.

for 64kbps: (SF16 x 1 code x 1 timeslot) + (SF4 x 1 code x 1 timeslot)

for 64kbps: (SF2 x 1 code x 1 timeslot)