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

RP-020309

Title: **Agreed CRs (R99 and Rel-4/Rel-5 Category A) to TS 25.213**

Source: **TSG-RAN WG1**

Agenda item: **7.1.3**

No.	Spec	CR	Rev	R1 T-doc	Subject	Phase	Cat	Work Item	V_old	V_new
1	25.213	051	1	R1-02-0385	Downlink bit mapping	R99	F	TEI	3.7.0	3.8.0
2	25.213	052	1	R1-02-0385	Downlink bit mapping	Rel-4	A	TEI	4.2.0	4.3.0
3	25.213	053	1	R1-02-0385	Downlink bit mapping	Rel-5	A	TEI	5.0.0	5.1.0

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R1-02-0385

CR-Form-v5

CHANGE REQUEST

z **25.213** **CR** **051** z **rev** **1** z Current version: **3.7.0** z

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

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

Title:	z	Downlink bit mapping
Source:	z	TSG RAN WG1
Work item code:	z	TEI
Date:	z	2002-05-10
Category:	z	**F**
Release:	z	R99

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:	z	The current description of signal formats for the interfaces between different RAN1 specifications does not consider all types of signals. The signal formats output from 25.211 and 25.212 are formally not compatible with the spreading operation in 25.213. In particular, there is ambiguity about binary, real-valued and DTX signals and their mapping. Moreover, the mapping of 0/1 to real-valued +1/-1 is not specified. Also, the title of figure 9 does not correspond to the contents of the figure.
Summary of change:	z	The mapping of real-valued signals and 3-valued digits to a real-valued signal at the input of spreading is speficied. Title of figure 9 is corrected.
Consequences if not approved:	z	Misleading information regarding signal formats on the interfaces between RAN1 specifications. Unclear bit mapping in downlink, which may lead to incompatible UE's and NodeB's.

Clauses affected:	z	5.1
Other specs affected:	z	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	z	
Other comments:	z	Isolated impact analysis: The implementation of this CR may impact existing UE or UTRAN implementations. UEs or NodeBs that have implemented the downlink bit mapping such that binary "0" is mapped to other values than +1 or binary "1" is mapped to other values than –1 are not compliant with this CR.

5 Downlink spreading and modulation

5.1 Spreading

Figure 8 illustrates the spreading operation for all downlink physical channels except SCH, i.e. for P-CCPCH, S-CCPCH, CPICH, AICH, AP-AICH, CD/CA-ICH, PICH, CSICH, PDSCH, and downlink DPCH. The non-spread physical channels except SCH, AICH, AP-AICH and CD/CA-ICH consists of a sequence of 3-valued digits taking the values 0, 1, "DTX". Note that "DTX" is only applicable to those downlink physical channels that support DTX transmission. Before the spreading operation, these are mapped to real-valued symbols as follows: the binary value "0" is mapped to the real value +1, the binary value "1" is mapped to the real value –1 and "DTX" is mapped to the real value 0. For all channels except AICH, the symbols can take the three values +1, -1, and 0, where 0 indicates DTX. For the indicator channels using signatures (AICH, AP-AICH and CD/CA-ICH), the real-valued symbols values depend on the exact combination of acquisition the indicators to be transmitted, compare [2] sections 5.3.3.7, 5.3.3.8 and 5.3.3.9 Section 5.3.3.6.

Each pair of two consecutive real-valued symbols is first serial-to-parallel converted and mapped to an I and Q branch. The mapping is such that even and odd numbered symbols are mapped to the I and Q branch respectively. For all channels except the indicator channels using signaturesAICH, symbol number zero is defined as the first symbol in each frame. For the indicator channels using signaturesAICH, symbol number zero is defined as the first symbol in each access slot. The I and Q branches are then both spread to the chip rate by the same real-valued channelization code $C_{ch,SF,m}$. The channelization code sequence shall be aligned in time with the symbol boundary. The sequences of real-valued chips on the I and Q branch are then treated as a single complex-valued sequence of chips. This sequence of chips is scrambled (complex chip-wise multiplication) by a complex-valued scrambling code $S_{dl,n}$. In case of P-CCPCH, the scrambling code is applied aligned with the P-CCPCH frame boundary, i.e. the first complex chip of the spread P-CCPCH frame is multiplied with chip number zero of the scrambling code. In case of other downlink channels, the scrambling code is applied aligned with the scrambling code applied to the P-CCPCH. In this case, the scrambling code is thus not necessarily applied aligned with the frame boundary of the physical channel to be scrambled.

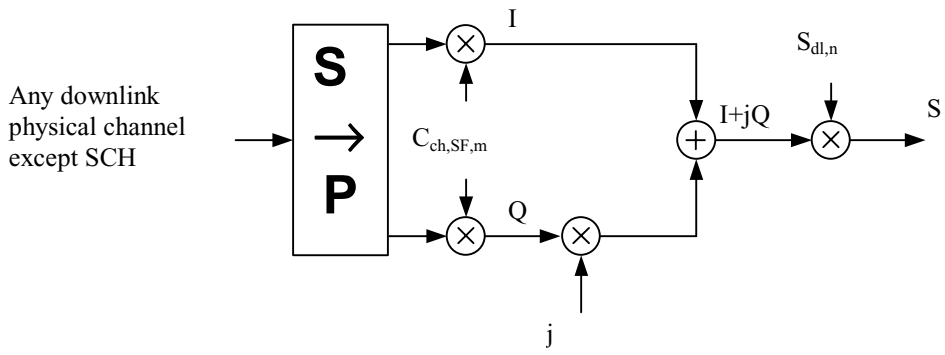

Figure 8: Spreading for all downlink physical channels except SCH

Figure 9 illustrates how different downlink channels are combined. Each complex-valued spread channel, corresponding to point S in Figure 8, is separately weighted by a weight factor G_i. The complex-valued P-SCH and S-SCH, as described in [2], section 5.3.3.45, are separately weighted by weight factors G_p and G_s. All downlink physical channels are then combined using complex addition.

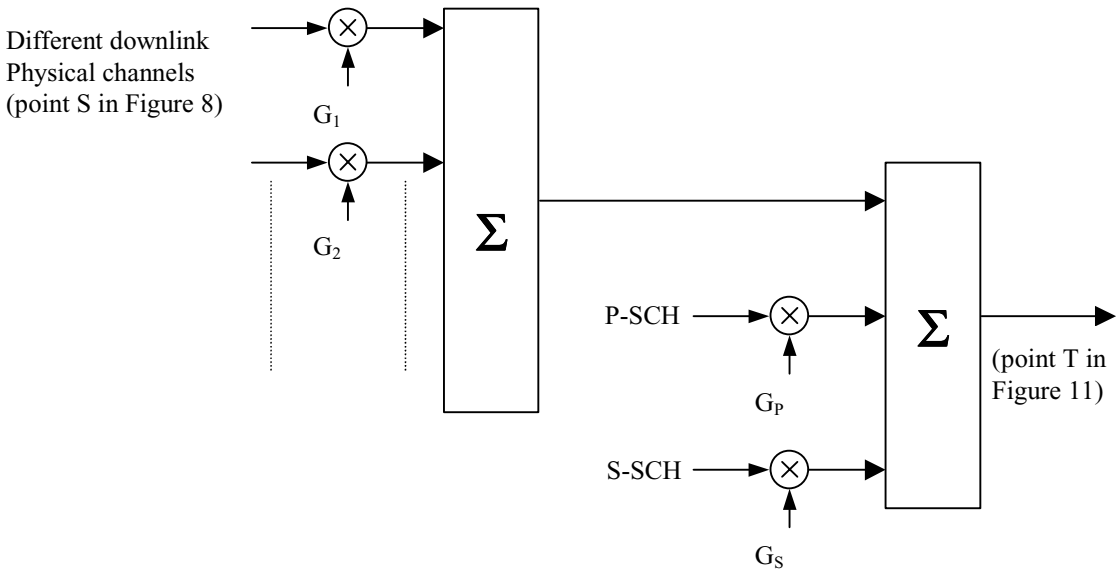

Figure 9: ~~Spreading and modulation for SCH and P-CCPCH~~Combining of downlink physical channels

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CHANGE REQUEST

z **25.213** **CR** **052** z **rev** **1** z Current version: **4.2.0** z

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

Title:	z	Downlink bit mapping
Source:	z	TSG RAN WG1
Work item code:	z	TEI
Date:	z	2002-05-10
Category:	z	**A**
Release:	z	REL-4

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)*
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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:	z	The current description of signal formats for the interfaces between different RAN1 specifications does not consider all types of signals. The signal formats output from 25.211 and 25.212 are formally not compatible with the spreading operation in 25.213. In particular, there is ambiguity about binary, real-valued and DTX signals and their mapping. Moreover, the mapping of 0/1 to real-valued +1/-1 is not specified. Also, the title of figure 9 does not correspond to the contents of the figure.
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Clauses affected:	z	5.1
Other specs affected:	z	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	z	
Other comments:	z	Isolated impact analysis: The implementation of this CR may impact existing UE or UTRAN implementations. UEs or NodeBs that have implemented the downlink bit mapping such that binary "0" is mapped to other values than +1 or binary "1" is mapped to other values than –1 are not compliant with this CR.

5 Downlink spreading and modulation

5.1 Spreading

Figure 8 illustrates the spreading operation for all downlink physical channels except SCH, i.e. for P-CCPCH, S-CCPCH, CPICH, AICH, AP-AICH, CD/CA-ICH, PICH, CSICH, PDSCH, and downlink DPCH. The non-spread physical channels except SCH, AICH, AP-AICH and CD/CA-ICH consists of a sequence of 3-valued digits taking the values 0, 1, "DTX". Note that "DTX" is only applicable to those downlink physical channels that support DTX transmission. Before the spreading operation, these are mapped to real-valued symbols as follows: the binary value "0" is mapped to the real value +1, the binary value "1" is mapped to the real value –1 and "DTX" is mapped to the real value 0. For all channels except AICH, the symbols can take the three values +1, -1, and 0, where 0 indicates DTX. For the indicator channels using signatures (AICH, AP-AICH and CD/CA-ICH), the real-valued symbols values depend on the exact combination of acquisition the indicators to be transmitted, compare [2] sections 5.3.3.7, 5.3.3.8 and 5.3.3.9 Section 5.3.3.6.

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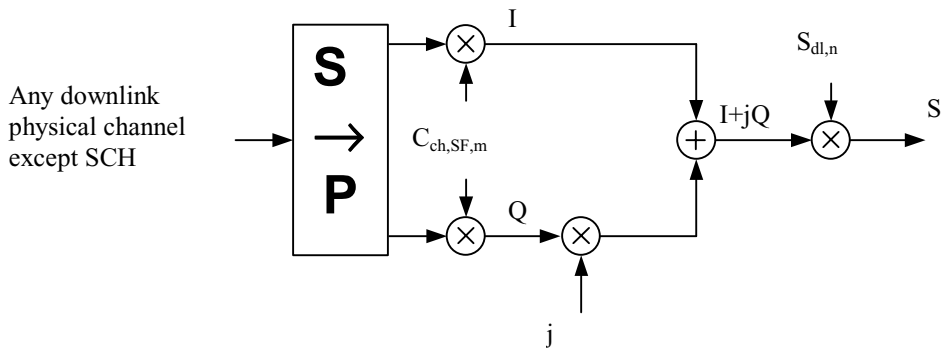
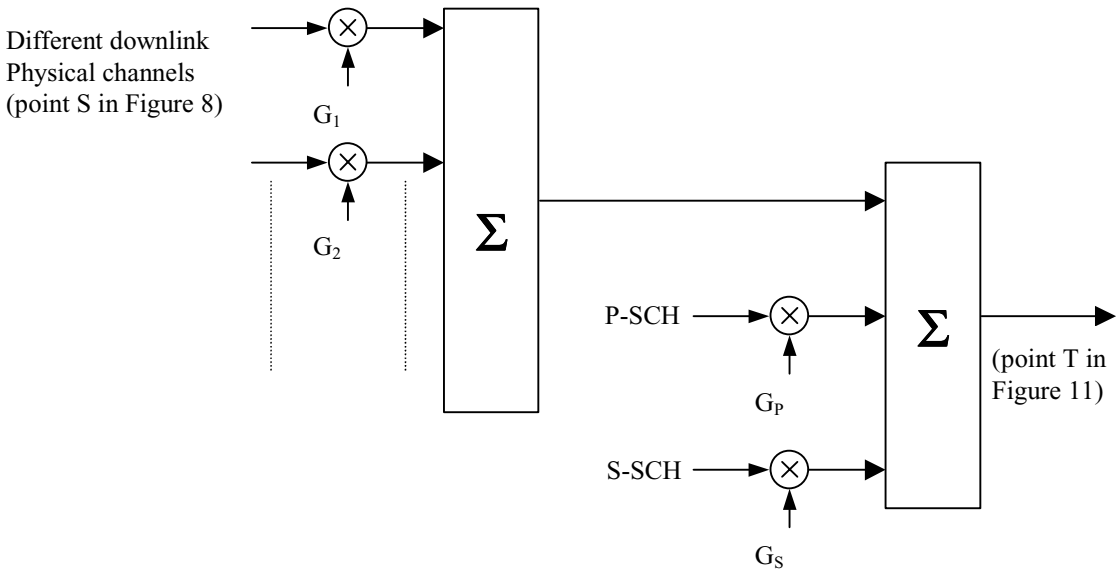


Figure 8: Spreading for all downlink physical channels except SCH

Figure 9 illustrates how different downlink channels are combined. Each complex-valued spread channel, corresponding to point S in Figure 8, is separately weighted by a weight factor G_i. The complex-valued P-SCH and S-SCH, as described in [2], section 5.3.3.45, are separately weighted by weight factors G_p and G_s. All downlink physical channels are then combined using complex addition.



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Date:	z	2002-05-10
Category:	z	**A**
Release:	z	REL-5

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	z	
Other comments:	z	Isolated impact analysis: The implementation of this CR may impact existing UE or UTRAN implementations. UEs or NodeBs that have implemented the downlink bit mapping such that binary "0" is mapped to other values than +1 or binary "1" is mapped to other values than –1 are not compliant with this CR.

5 Downlink spreading and modulation

5.1 Spreading

Figure 8 illustrates the spreading operation for the physical channel except SCH. The behaviour of the modulation mapper is different between QPSK and 16QAM. The downlink physical channels using QPSK are P-CCPCH, S-CCPCH, CPICH, AICH, AP-AICH, CSICH, CD/CA-ICH, PICH, PDSCH, HS-SCCH and downlink DPCH. ~~The SCH consists of a sequence of real-valued symbols.~~ The downlink physical channel using ~~both~~ either QPSK ~~and~~ or 16 QAM is HS-PDSCH. The non-spread downlink physical channels, except SCH, AICH, AP-ICH and CD/CA-ICH, consist of a sequence of 3-valued digits taking the values 0, 1 and "DTX". Note that "DTX" is only applicable to those downlink physical channels that support DTX transmission. In case of QPSK, these digits are mapped to real-valued symbols as follows: the binary value "0" is mapped to the real value +1, the binary value "1" is mapped to the real value –1 and "DTX" is mapped to the real value 0. ~~For all channels except the indicator channels using signatures (AICH, AP-AICH and CD/CA-ICH) and HS-PDSCH the symbols can take the three values +1, –1, and 0, where 0 indicates DTX.~~ For the indicator channels using signatures (AICH, AP-AICH and CD/CA-ICH), the real-valued symbols ~~values~~ depend on the exact combination of the indicators to be transmitted, compare [2] s~~S~~ections 5.3.3.7, 5.3.3.8 and 5.3.3.9.

~~For physical channel using~~ In case of QPSK, each pair of two consecutive real-valued symbols is first serial-to-parallel converted and mapped to an I and Q branch. The ~~behaviour~~ definition of the modulation mapper is such that even and odd numbered symbols are mapped to the I and Q branch respectively. In case of QPSK, ~~For~~ for all channels ~~using QPSK~~ except the indicator channels using signatures, symbol number zero is defined as the first symbol in each frame. For the indicator channels using signatures, symbol number zero is defined as the first symbol in each access slot. The I and Q branches are then both spread to the chip rate by the same real-valued channelisation code $C_{ch,SF,m}$. The channelisation code sequence shall be aligned in time with the symbol boundary. The sequences of real-valued chips on the I and Q branch are then treated as a single complex-valued sequence of chips. This sequence of chips is scrambled (complex chip-wise multiplication) by a complex-valued scrambling code $S_{dl,n}$. In case of P-CCPCH, the scrambling code is applied aligned with the P-CCPCH frame boundary, i.e. the first complex chip of the spread P-CCPCH frame is multiplied with chip number zero of the scrambling code. In case of other downlink channels, the scrambling code is applied aligned with the scrambling code applied to the P-CCPCH. In this case, the scrambling code is thus not necessarily applied aligned with the frame boundary of the physical channel to be scrambled.

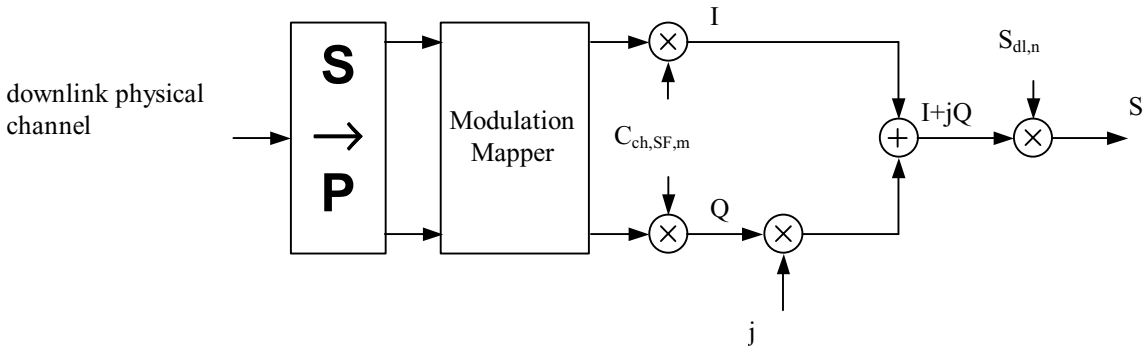

Figure 8: Spreading for all downlink physical channels except SCH

~~For physical channel using~~ In case of 16QAM, a set of consecutive binary symbols is serial-to-parallel converted and then mapped to 16QAM by the ~~M~~modulation mapper. The I and Q branches are then both spread to the chip rate by the same real-valued channelisation code $C_{ch,16,m}$. The channelisation code sequence shall be aligned in time with the symbol boundary. The sequences of real-valued chips on the I and Q branch are then treated as a single complex-valued sequence of chips. This sequence of chips from all multi-codes is summed and then scrambled (complex chip-wise multiplication) by a complex-valued scrambling code $S_{dl,n}$. The scrambling code is applied aligned with the scrambling code applied to the P-CCPCH.

The serial to parallel conversion uses four bits which result in index bits allocated to I and Q according to table 4. These index bits are mapped to the modulated constellation symbols as illustrated in figure 9~~xx~~.

Table 4: 16 QAM index bits

i	0	1	2	3
b(i)	i_1	q_1	i_2	q_2

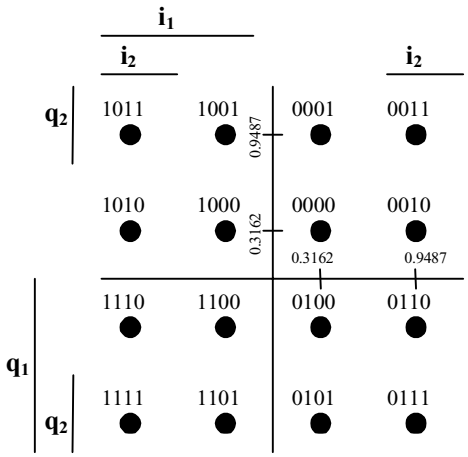

Figure 9: 16 QAM constellation

Figure 10 illustrates how different downlink channels are combined. Each complex-valued spread channel, corresponding to point S in Figure 8, is separately weighted by a weight factor G_i. The complex-valued P-SCH and S-SCH, as described in [2], section 5.3.3.45, are separately weighted by weight factors G_p and G_s. All downlink physical channels are then combined using complex addition.

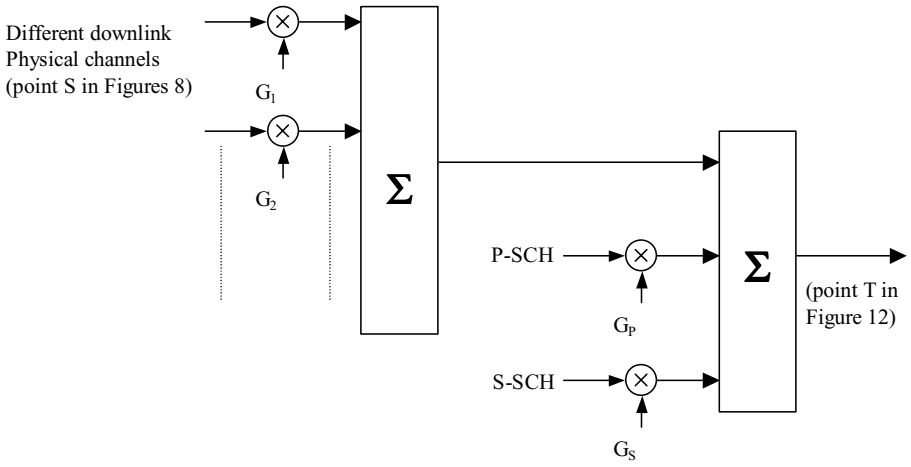

Figure 10: ~~Spreading and modulation for SCH and P-CCPCH~~Combining of downlink physical channels