TSG RAN Meeting #26 **RP-040450**
Athens, Greece, 8 - 10 December 2004

Title **Linked CRs (Rel-6 Category B) to TS25.211 & TS25.213 & TS25.214 for Introduction of MICH**
Source **TSG RAN WG1**
Agenda Item **8.4**

RAN1 Tdoc	Spec	CR	Rev	Phase	Cat	Current Version	Subject	Work item	Remarks
R1-041506	25.211	193	1	Rel-6	B	6.2.0	Introduction of MICH	MBMS-RAN	
R1-041100	25.213	69	-	Rel-6	B	6.0.0	Introduction of MICH	MBMS-RAN	
R1-041101	25.214	351	-	Rel-6	B	6.3.0	Introduction of MICH	MBMS-RAN	

Tdoc ⌘R1-041506

CR-Form-v7.1

CHANGE REQUEST

⌘	**25.211**	**CR**	**193**	⌘**rev**	**1**	⌘	Current version: **6.2.0**	⌘

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

Title:	⌘	Introduction of MICH		
Source:	⌘	RAN WG1		
Work item code:	⌘	MBMS-RAN	***Date:*** ⌘	18/11/2004
Category:	⌘	**B**	***Release:*** ⌘	Rel-6
		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:* *Ph2 (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)* *Rel-7 (Release 7)*

Reason for change:	⌘	Support of power efficient MBMS reception in the UE
Summary of change:	⌘	Introduction of the MBMS notification channel
Consequences if not approved:	⌘	

Clauses affected:	⌘	3.2, 4.2, 5.3.1, 5.3.3, 6.1, 7				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	25.213, 25.214, 25.331, 25.433
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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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.

3.2 Abbreviations

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

16QAM	16 Quadrature Amplitude Modulation
AI	Acquisition Indicator
AICH	Acquisition Indicator Channel
AP	Access Preamble
AP-AICH	Access Preamble Acquisition Indicator Channel
API	Access Preamble Indicator
BCH	Broadcast Channel
CA	Channel Assignment
CAI	Channel Assignment Indicator
CCC	CPCH Control Command
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Collision Detection
CD/CA-ICH	Collision Detection/Channel Assignment Indicator Channel
CDI	Collision Detection Indicator
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
CQI	Channel Quality Indicator
CSICH	CPCH Status Indicator Channel
DCH	Dedicated Channel
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
DSCH	Downlink Shared Channel
DSMA-CD	Digital Sense Multiple Access - Collison Detection
DTX	Discontinuous Transmission
FACH	Forward Access Channel
FBI	Feedback Information
FSW	Frame Synchronization Word
HS-DPCCH	Dedicated Physical Control Channel (uplink) for HS-DSCH
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	Shared Control Channel for HS-DSCH
ICH	Indicator Channel
MICH	MBMS Indicator Channel
MUI	Mobile User Identifier
NI	MBMS Notification Indicator
PCH	Paging Channel
P-CCPCH	Primary Common Control Physical Channel
PCPCH	Physical Common Packet Channel
PDSCH	Physical Downlink Shared Channel
PICH	Page Indicator Channel
PRACH	Physical Random Access Channel
PSC	Primary Synchronisation Code
RACH	Random Access Channel
RNC	Radio Network Controller
S-CCPCH	Secondary Common Control Physical Channel
SCH	Synchronisation Channel
SF	Spreading Factor
SFN	System Frame Number
SI	Status Indicator
SSC	Secondary Synchronisation Code
STTD	Space Time Transmit Diversity
TFCI	Transport Format Combination Indicator
TSTD	Time Switched Transmit Diversity
TPC	Transmit Power Control
UE	User Equipment

UTRAN UMTS Terrestrial Radio Access Network

-------------------------------------- [Next modified section] --

4.2 Indicators

Indicators are means of fast low-level signalling entities which are transmitted without using information blocks sent over transport channels. The meaning of indicators is specific to the type of indicator.

The indicators defined in the current version of the specifications are: Acquisition Indicator (AI), Access Preamble Indicator (API), Channel Assignment Indicator (CAI), Collision Detection Indicator (CDI), Page Indicator (PI), MBMS Notification Indicator (NI) and Status Indicator (SI).

Indicators may be either boolean (two-valued) or three-valued. Their mapping to indicator channels is channel specific.

Indicators are transmitted on those physical channels that are indicator channels (ICH).

-------------------------------------- [Next modified section] --

5.3.1 Downlink transmit diversity

Table 10 summarises 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 for DPCH 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 on only those radio links where STTD has been activated. Higher layers inform the UE about the usage of STTD on the individual 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 on only those radio links where closed loop TX diversity has been activated. Higher layers inform the UE about the usage of closed loop TX diversity on the individual 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-PDSCH subframe shall be the same as the transmit diversity mode used for the DPCH associated with this HS-PDSCH subframe. If the DPCH associated with an HS-SCCH subframe is using either open or closed loop transmit diversity on the radio link transmitted from the HS-DSCH serving cell, the HS-SCCH subframe from this cell shall be transmitted using STTD, otherwise no transmit diversity shall be used for this HS-SCCH 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 and either open loop or closed loop mode.

Table 10: Application of Tx diversity modes on downlink physical channel types "X" – can be applied, "–" – not applied

Physical channel type	Open loop mode		Closed loop mode	
	TSTD	STTD	Mode 1	Mode 2
P-CCPCH	–	X	–	–
SCH	X	–	–	–
S-CCPCH	–	X	–	–
DPCH	–	X	X	X
PICH	–	X	–	–
MICH	–	X	–	–
PDSCH	–	X	X	X
HS-PDSCH	–	X	X	–
HS-SCCH	–	X	–	–
AICH	–	X	–	–
CSICH	–	X	–	–
AP-AICH	–	X	–	–
CD/CA-ICH	–	X	–	–
DL-DPCCH for CPCH	–	X	X	X

-------------------------------------- [Next modified section] --

5.3.3.2 Downlink phase reference

Table 17 summarizes the possible phase references usable on different downlink physical channel types.

Table 17: Application of phase references on downlink physical channel types "X" – can be applied, "–" – not applied

Physical channel type	Primary-CPICH	Secondary-CPICH	Dedicated pilot
P-CCPCH	X	–	–
SCH	X	–	–
S-CCPCH	X	–	–
DPCH	X	X	X
PICH	X	–	–
MICH	X	–	–
PDSCH*	X	X	X
HS-PDSCH*	X	X	X
HS-SCCH*	X	X	X
AICH	X	–	–
CSICH	X	–	–
DL-DPCCH for CPCH	X	–	–

Note *: The same phase reference as with the associated DPCH shall be used. The support for dedicated pilots as phase reference for HS-PDSCH and HS-SCCH is optional for the UE.

Furthermore, during a PDSCH frame, and within the slot prior to that PDSCH frame, the phase reference on the associated DPCH shall not change. During a DPCH frame overlapping with any part of an associated HS-DSCH or HS-SCCH subframe, the phase reference on this DPCH shall not change.

-------------------------------------- [New section added] --

5.3.3.14 MBMS Indicator Channel (MICH)

The MBMS Indicator Channel (MICH) is a fixed rate (SF=256) physical channel used to carry the MBMS notification indicators. The MICH is always associated with an S-CCPCH to which a FACH transport channel is mapped.

Figure 26C illustrates the frame structure of the MICH. One MICH radio frame of length 10 ms consists of 300 bits (b_0, b_1, …, b_{299}). Of these, 288 bits (b_0, b_1, …, b_{287}) are used to carry notification indicators. The remaining 12 bits are not formally part of the MICH and shall not be transmitted (DTX).

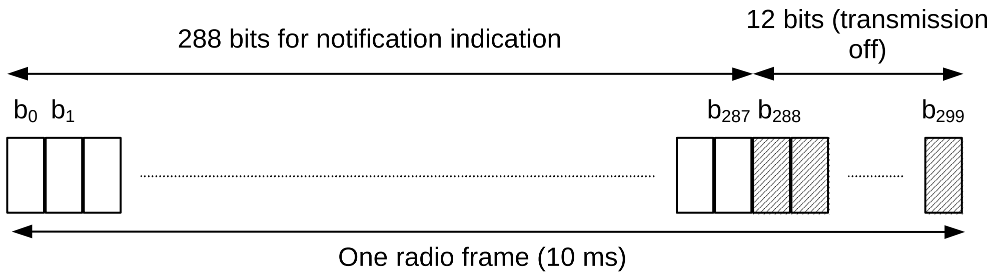

Figure 26C: Structure of MBMS Indicator Channel (MICH)

In each MICH frame, Nn notification indicators $\{N_0, …, N_{Nn-1}\}$ are transmitted, where Nn=18, 36, 72, or 144.

The set of NI calculated by higher layers, is associated to a set of notification indicators N_q, where q is computed as a function of the NI computed by higher layers, the SFN of the P-CCPCH radio frame during which the start of the MICH radio frame occurs, and the number of notification indicators per frame (Nn):

$$q = \left\lfloor \left(\left(C \times \left(\mathrm{NI} \oplus \left(\left(C \times SFN \right) \bmod G \right) \right) \right) \bmod G \right) \times \frac{Nn}{G} \right\rfloor$$

where $G = 2^{16}$ and C = 25033.

The set of NI signalled over Iub indicates all higher layer NI values for which the notification indicator on MICH should be set to 1 during the corresponding modification period; all other indicators shall be set to 0. Hence, the calculation in the formula above shall be performed in the Node B every MICH frame to make the association between NI and N_q.

The mapping from $\{N_0, …, N_{Nn-1}\}$ to the MICH bits $\{b_0, …, b_{287}\}$ are according to table 27.

Table 27: Mapping of paging indicators N_q to MICH bits

Number of notification indicators per frame (Nn)	**$N_q = 1$**	**$N_q = 0$**
Nn=18	$\{b_{16q}, …, b_{16q+15}\} = \{1, 1,…, 1\}$	$\{b_{16q}, …, b_{16q+15}\} = \{0, 0,…, 0\}$
Nn=36	$\{b_{8q}, …, b_{8q+7}\} = \{1, 1,…, 1\}$	$\{b_{8q}, …, b_{8q+7}\} = \{0, 0,…, 0\}$
Nn=72	$\{b_{4q}, …, b_{4q+3}\} = \{1, 1,…, 1\}$	$\{b_{4q}, …, b_{4q+3}\} = \{0, 0,…, 0\}$
Nn=144	$\{b_{2q}, b_{2q+1}\} = \{1, 1\}$	$\{b_{2q}, b_{2q+1}\} = \{0, 0\}$

When transmit diversity is employed for the MICH, STTD encoding is used on the MICH bits as described in subclause 5.3.1.1.1.

6 Mapping and association of physical channels

6.1 Mapping of transport channels onto physical channels

Figure 27 summarises the mapping of transport channels onto physical channels.

Transport Channels	**Physical Channels**
DCH	Dedicated Physical Data Channel (DPDCH)
	Dedicated Physical Control Channel (DPCCH)
RACH	Physical Random Access Channel (PRACH)
CPCH	Physical Common Packet Channel (PCPCH)
	Common Pilot Channel (CPICH)
BCH	Primary Common Control Physical Channel (P-CCPCH)
FACH	Secondary Common Control Physical Channel (S-CCPCH)
PCH	
	Synchronisation Channel (SCH)
DSCH	Physical Downlink Shared Channel (PDSCH)
	Acquisition Indicator Channel (AICH)
	Access Preamble Acquisition Indicator Channel (AP-AICH)
	Paging Indicator Channel (PICH)
	MBMS Notification Indicator Channel (MICH)
	CPCH Status Indicator Channel (CSICH)
	Collision-Detection/Channel-Assignment Indicator Channel (CD/CA-ICH)
HS-DSCH	High Speed Physical Downlink Shared Channel (HS-PDSCH)
	HS-DSCH-related Shared Control Channel (HS-SCCH)
	Dedicated Physical Control Channel (uplink) for HS-DSCH (HS-DPCCH)

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	HS-DSCH-related Shared Control Channel (HS-SCCH)
	Dedicated Physical Control Channel (uplink) for HS-DSCH (HS-DPCCH)

Figure 27: Transport-channel to physical-channel mapping

The DCHs are coded and multiplexed as described in [3], and the resulting data stream is mapped sequentially (first-in-first-mapped) directly to the physical channel(s). The mapping of BCH and FACH/PCH is equally straightforward, where the data stream after coding and interleaving is mapped sequentially to the Primary and Secondary CCPCH respectively. Also for the RACH, the coded and interleaved bits are sequentially mapped to the physical channel, in this case the message part of the PRACH.

--------------------------------------- [Next relevant section] --

7 Timing relationship between physical channels

--------------------------------------- [New section added] --

7.9 MICH/S-CCPCH timing relation

Figure 36 illustrates the timing between the MICH frame boundaries and the frame boundaries of the associated S-CCPCH, i.e. the S-CCPCH that carries the MBMS control information related to the notification indicators in the MICH frame. The MICH transmission timing shall be such that the end of radio frame boundary occurs τ_{MICH} chips before the associated S-CCPCH start of radio frame boundary. τ_{MICH} is equal to 7680 chips.

The MICH frames during which the Node B shall set specific notification indicators and the S-CCPCH frames during which the Node B shall transmit the corresponding MBMS control data is defined by higher layers.

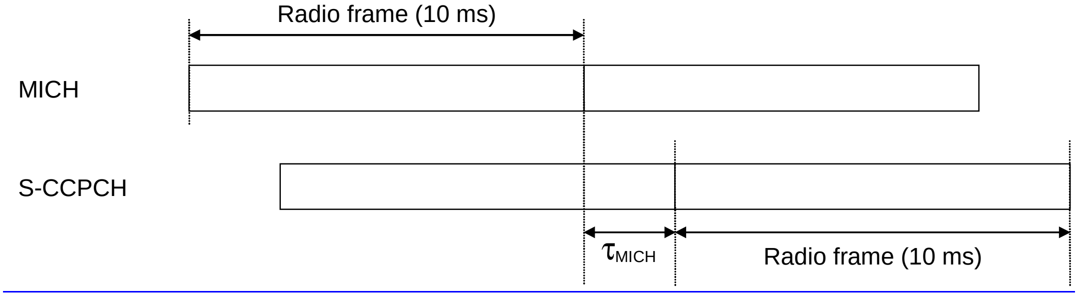

Figure 36: Timing relation between MICH frame and associated S-CCPCH frame

3GPP TSG-RAN1 Meeting #38bis
Seoul, Korea, September 20th-24th, 2004

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CR-Form-v7.1

CHANGE REQUEST

⌘	**25.213**	**CR**	**69**	⌘**rev**	**-**	⌘ Current version:	**6.0.0** ⌘

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

Title:	⌘	Introduction of MICH		
Source:	⌘	RAN WG1		
Work item code:	⌘	MBMS-RAN	***Date:*** ⌘	14/09/2004
Category:	⌘	**B**	***Release:*** ⌘	Rel-6
		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:* *Ph2 (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)* *Rel-7 (Release 7)*

Reason for change:	⌘	Support of power efficient MBMS reception in the UE
Summary of change:	⌘	Introduction of the MBMS notification channel
Consequences if not approved:	⌘	

Clauses affected:	⌘	3.2, 5.1, 5.2.2				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	25.211, 25.214, 25.331, 25.433
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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-- [Next modified section] ---

3.2 Abbreviations

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

16QAM	16 Quadrature Amplitude Modulation
AICH	Acquisition Indicator Channel
AP	Access Preamble
BCH	Broadcast Control Channel
CCPCH	Common Control Physical Channel
CD	Collision Detection
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
DCH	Dedicated Channel
DPCH	Dedicated Physical Channel
DPCCH	Dedicated Physical Control Channel
DPDCH	Dedicated Physical Data Channel
FDD	Frequency Division Duplex
HS-DPCCH	Dedicated Physical Control Channel (uplink) for HS-DSCH
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	Shared Control Physical Channel for HS-DSCH
Mcps	Mega Chip Per Second
MICH	MBMS Indication Channel
OVSF	Orthogonal Variable Spreading Factor (codes)
PDSCH	Physical Dedicated Shared Channel
PICH	Page Indication Channel
PRACH	Physical Random Access Channel
PSC	Primary Synchronisation Code
RACH	Random Access Channel
SCH	Synchronisation Channel
SSC	Secondary Synchronisation Code
SF	Spreading Factor
UE	User Equipment

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, MICH, PDSCH, HS-SCCH and downlink DPCH. The downlink physical channel using either QPSK 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 the indicator channels using signatures (AICH, AP-AICH and CD/CA-ICH), the real-valued symbols depend on the exact combination of the indicators to be transmitted, compare [2] sections 5.3.3.7, 5.3.3.8 and 5.3.3.9.

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 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 all channels 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.

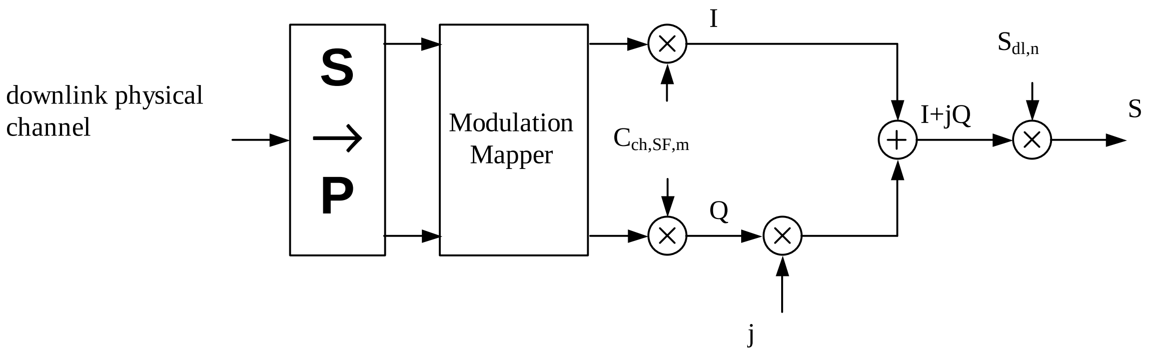

Figure 8: Spreading for all downlink physical channels except SCH

In case of 16QAM, a set of four consecutive binary symbols n_k, n_{k+1}, n_{k+2}, n_{k+3} (with k mod 4 = 0) is serial-to-parallel converted to two consecutive binary symbols ($i_1 = n_k$, $i_2 = n_{k+2}$) on the I branch and two consecutive binary symbols ($q_1 = n_{k+1}$, $q_2 = n_{k+3}$) on the Q branch and then mapped to 16QAM by the modulation mapper as defined in table 3A. 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.

Table 3A: 16 QAM modulation mapping

$i_1q_1i_2q_2$	I branch	Q branch
0000	0.4472	0.4472
0001	0.4472	1.3416
0010	1.3416	0.4472
0011	1.3416	1.3416
0100	0.4472	-0.4472
0101	0.4472	-1.3416
0110	1.3416	-0.4472
0111	1.3416	-1.3416
1000	-0.4472	0.4472
1001	-0.4472	1.3416
1010	-1.3416	0.4472
1011	-1.3416	1.3416
1100	-0.4472	-0.4472
1101	-0.4472	-1.3416
1110	-1.3416	-0.4472
1111	-1.3416	-1.3416

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 5.3.3.5, are separately weighted by weight factors G_p and G_s. All downlink physical channels are then combined using complex addition.

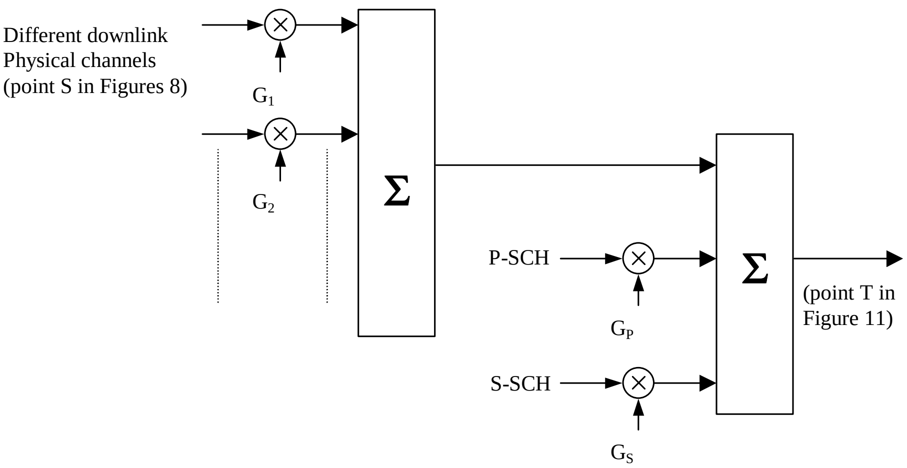

Figure 9: Combining of downlink physical channels

5.2 Code generation and allocation

5.2.1 Channelisation codes

The channelisation codes of figure 8 are the same codes as used in the uplink, namely Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between downlink channels of different rates and spreading factors. The OVSF codes are defined in figure 4 in section 4.3.1.

The channelisation code for the Primary CPICH is fixed to $C_{ch,256,0}$ and the channelisation code for the Primary CCPCH is fixed to $C_{ch,256,1}$.The channelisation codes for all other physical channels are assigned by UTRAN.

With the spreading factor 512 a specific restriction is applied. When the code word $C_{ch,512,n}$, with n=0,2,4….510, is used in soft handover, then the code word $C_{ch,512,n+1}$ is not allocated in the cells where timing adjustment is to be used. Respectively if $C_{ch,512,n}$, with n=1,3,5….511 is used, then the code word $C_{ch,512,n-1}$ is not allocated in the cells where timing adjustment is to be used. This restriction shall not apply in cases where timing adjustments in soft handover are not used with spreading factor 512.

When compressed mode is implemented by reducing the spreading factor by 2, the OVSF code used for compressed frames is:

- $C_{ch,SF/2,\lfloor n/2 \rfloor}$ if ordinary scrambling code is used.
- $C_{ch,SF/2,n \bmod SF/2}$ if alternative scrambling code is used (see section 5.2.2);

where $C_{ch,SF,n}$ is the channelisation code used for non-compressed frames.

In case the OVSF code on the PDSCH varies from frame to frame, the OVSF codes shall be allocated in such a way that the OVSF code(s) below the smallest spreading factor will be from the branch of the code tree pointed by the code with smallest spreading factor used for the connection which is called PDSCH root channelisation code. This means that all the codes for this UE for the PDSCH connection can be generated according to the OVSF code generation principle from the PDSCH root channelisation code i.e. the code with smallest spreading factor used by the UE on PDSCH.

In case of mapping the DSCH to multiple parallel PDSCHs, the same rule applies, but all of the branches identified by the multiple codes, corresponding to the smallest spreading factor, may be used for higher spreading factor allocation i.e. the multiple codes with smallest spreading factor can be considered as PDSCH root channelisation codes.

For HS-PDSCH, the spreading factor is always 16.

For HS-SCCH, the spreading factor is always 128.

Channelisation-code-set information over HS-SCCH is mapped in following manner: the OVSF codes shall be allocated in such a way that they are positioned in sequence in the code tree. That is, for P multicodes at offset O the following codes are allocated:

$C_{ch,16,O} \ldots C_{ch,16,\,O+P-1}$

The number of multicodes and the corresponding offset for HS-PDSCHs mapped from a given HS-DSCH is signalled by HS-SCCH.

5.2.2 Scrambling code

A total of 2^{18}-1 = 262,143 scrambling codes, numbered 0…262,142 can be generated. However not all the scrambling codes are used. The scrambling codes are divided into 512 sets each of a primary scrambling code and 15 secondary scrambling codes.

The primary scrambling codes consist of scrambling codes n=16*i where i=0…511. The i:th set of secondary scrambling codes consists of scrambling codes 16*i+k, where k=1…15.

There is a one-to-one mapping between each primary scrambling code and 15 secondary scrambling codes in a set such that i:th primary scrambling code corresponds to i:th set of secondary scrambling codes.

Hence, according to the above, scrambling codes k = 0, 1, …, 8191 are used. Each of these codes are associated with a left alternative scrambling code and a right alternative scrambling code, that may be used for compressed frames. The left alternative scrambling code corresponding to scrambling code k is scrambling code number k + 8192, while the right alternative scrambling code corresponding to scrambling code k is scrambling code number k + 16384. The alternative scrambling codes can be used for compressed frames. In this case, the left alternative scrambling code is used if n<SF/2 and the right alternative scrambling code is used if n≥SF/2, where $c_{ch,SF,n}$ is the channelisation code used for non-compressed frames. The usage of alternative scrambling code for compressed frames is signalled by higher layers for each physical channel respectively.

The set of primary scrambling codes is further divided into 64 scrambling code groups, each consisting of 8 primary scrambling codes. The j:th scrambling code group consists of primary scrambling codes 16*8*j+16*k, where j=0..63 and k=0..7.

Each cell is allocated one and only one primary scrambling code. The primary CCPCH, primary CPICH, PICH, MICH, AICH, AP-AICH, CD/CA-ICH, CSICH and S-CCPCH carrying PCH are always transmitted using the primary scrambling code. The other downlink physical channels can be transmitted with either the primary scrambling code or a secondary scrambling code from the set associated with the primary scrambling code of the cell.

The mixture of primary scrambling code and no more than one secondary scrambling code for one CCTrCH is allowable. In compressed mode during compressed frames, these can be changed to the associated left or right scrambling codes as described above, i.e. in these frames, the total number of different scrambling codes may exceed two.

In the case of the CCTrCH of type DSCH, all the PDSCH channelisation codes that a single UE may receive shall be under a single scrambling code (either the primary or a secondary scrambling code). In the case of CCTrCH of type of HS-DSCH then all the HS-PDSCH channelisation codes and HS-SCCH that a single UE may receive shall be under a single scrambling code (either the primary or a secondary scrambling code).

The scrambling code sequences are constructed by combining two real sequences into a complex sequence. Each of the two real sequences are constructed as the position wise modulo 2 sum of 38400 chip segments of two binary *m*-sequences generated by means of two generator polynomials of degree 18. The resulting sequences thus constitute segments of a set of Gold sequences. The scrambling codes are repeated for every 10 ms radio frame. Let *x* and *y* be the two sequences respectively. The *x* sequence is constructed using the primitive (over GF(2)) polynomial $1+X^7+X^{18}$. The y sequence is constructed using the polynomial $1+X^5+X^7+X^{10}+X^{18}$.

The sequence depending on the chosen scrambling code number *n* is denoted z_n, in the sequel. Furthermore, let $x(i)$, $y(i)$ and $z_n(i)$ denote the *i*:th symbol of the sequence *x*, *y*, and z_n, respectively.

The *m*-sequences *x*and *y* are constructed as:

Initial conditions:

- x is constructed with x (0)=1, x(1)= x(2)=...= x (16)= x (17)=0.
- y(0)=y(1)= … =y(16)= y(17)=1.

Recursive definition of subsequent symbols:

- $x(i+18) = x(i+7) + x(i)$ modulo 2, $i=0,\ldots,2^{18}-20$.
- $y(i+18) = y(i+10)+y(i+7)+y(i+5)+y(i)$ modulo 2, $i=0,\ldots, 2^{18}-20$.

The n:th Gold code sequence z_n, $n=0,1,2,\ldots,2^{18}-2$, is then defined as:

- $z_n(i) = x((i+n) \text{ modulo } (2^{18} - 1)) + y(i)$ modulo 2, $i=0,\ldots, 2^{18}-2$.

These binary sequences are converted to real valued sequences Z_n by the following transformation:

$$Z_n(i) = \begin{cases} +1 & if \;\; z_n(i) = 0 \\ -1 & if \;\; z_n(i) = 1 \end{cases} \quad for \quad i = 0,1,\ldots,2^{18}-2.$$

Finally, the n:th complex scrambling code sequence $S_{dl,n}$ is defined as:

- $S_{dl,n}(i) = Z_n(i) + j\, Z_n((i+131072) \text{ modulo } (2^{18}-1))$, $i=0,1,\ldots,38399$.

Note that the pattern from phase 0 up to the phase of 38399 is repeated.

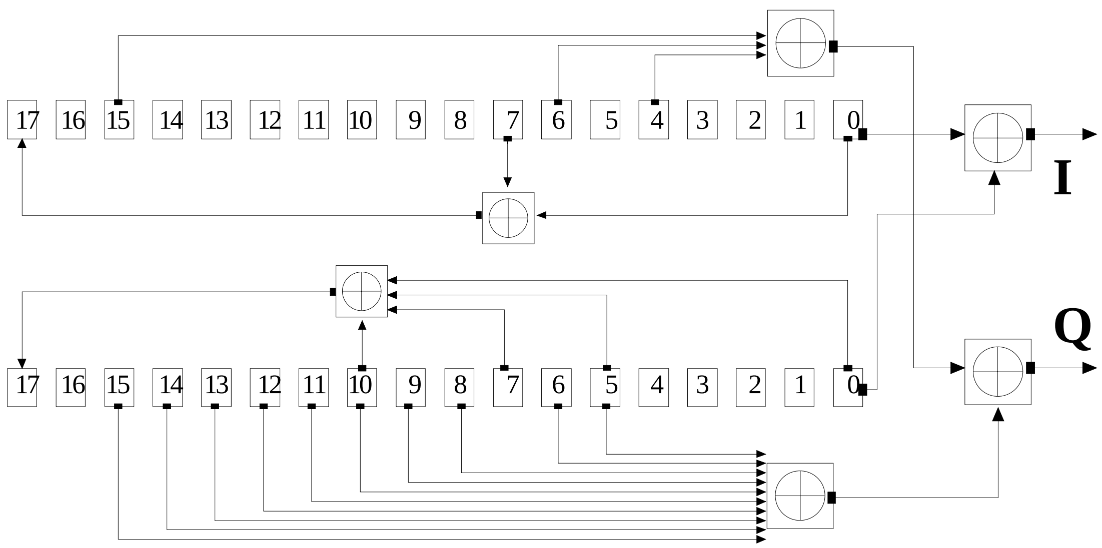

Figure 10: Configuration of downlink scrambling code generator

CR-Form-v7.1

CHANGE REQUEST

⌘	**25.214**	**CR**	**351**	⌘ **rev**	**-**	⌘	Current version:	**6.3.0**	⌘

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

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

Title:	⌘	Introduction of MICH
Source:	⌘	RAN WG1
Work item code:	⌘	MBMS-RAN
Date:	⌘	14/09/2004
Category:	⌘	**B**
Release:	⌘	Rel-6

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:
Ph2 (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)
Rel-7 (Release 7)

Reason for change:	⌘	Support of power efficient MBMS reception in the UE
Summary of change:	⌘	Introduction of the MBMS notification channel
Consequences if not approved:	⌘	

Clauses affected:	⌘	5.2				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	25.211, 25.213, 25.331, 25.433
			X	Test specifications		
			X	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:

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.

-------------------------------------- [Next modified section] ---

3 Abbreviations

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

ACK	Acknowledgement
AICH	Acquisition Indicator Channel
ASC	Access Service Class
AP	Access Preamble
BCH	Broadcast Channel
CA	Channel Assignment
CCC	CPCH Control Command
CCPCH	Common Control Physical Channel
CCTrCH	Coded Composite Transport Channel
CD	Collision Detection
CPCH	Common Packet Channel
CPICH	Common Pilot Channel
CQI	Channel Quality Indicator
CRC	Cyclic Redundancy Check
CSICH	CPCH Status Indicator Channel
DCH	Dedicated Channel
DL	Downlink
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
DTX	Discontinuous Transmission
HSDPA	High Speed Downlink Packet Access
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	High Speed Physical Downlink Shared Control Channel
MICH	MBMS Indicator Channel
NACK	Negative Acknowledgement
P-CCPCH	Primary Common Control Physical Channel
PCA	Power Control Algorithm
PCPCH	Physical Common Packet Channel
PDSCH	Physical Downlink Shared Channel
PICH	Paging Indicator Channel
PRACH	Physical Random Access Channel
RACH	Random Access Channel
RL	Radio Link
RPL	Recovery Period Length
RSCP	Received Signal Code Power
S-CCPCH	Secondary Common Control Physical Channel
SCH	Synchronisation Channel
SFN	System Frame Number
SIR	Signal-to-Interference Ratio
SNIR	Signal to Noise Interference Ratio
SSDT	Site Selection Diversity TPC
TFC	Transport Format Combination
TPC	Transmit Power Control
TrCH	Transport Channel
TTI	Transmission Time Interval
UE	User Equipment
UL	Uplink
UTRAN	UMTS Terrestrial Radio Access Network

--------------------------------------- [Next relevant section] --

5.2 Downlink power control

--------------------------------------- [New section added] --

5.2.12 MICH

The UE is informed about the relative transmit power of the MICH (measured as the power over the notification indicators) compared to the primary CPICH transmit power by the higher layers.