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(12) (19) (CA) **Demande-Application**

(21) (A1) **2,301,682**
(86) 1998/08/26
(87) 1999/03/11

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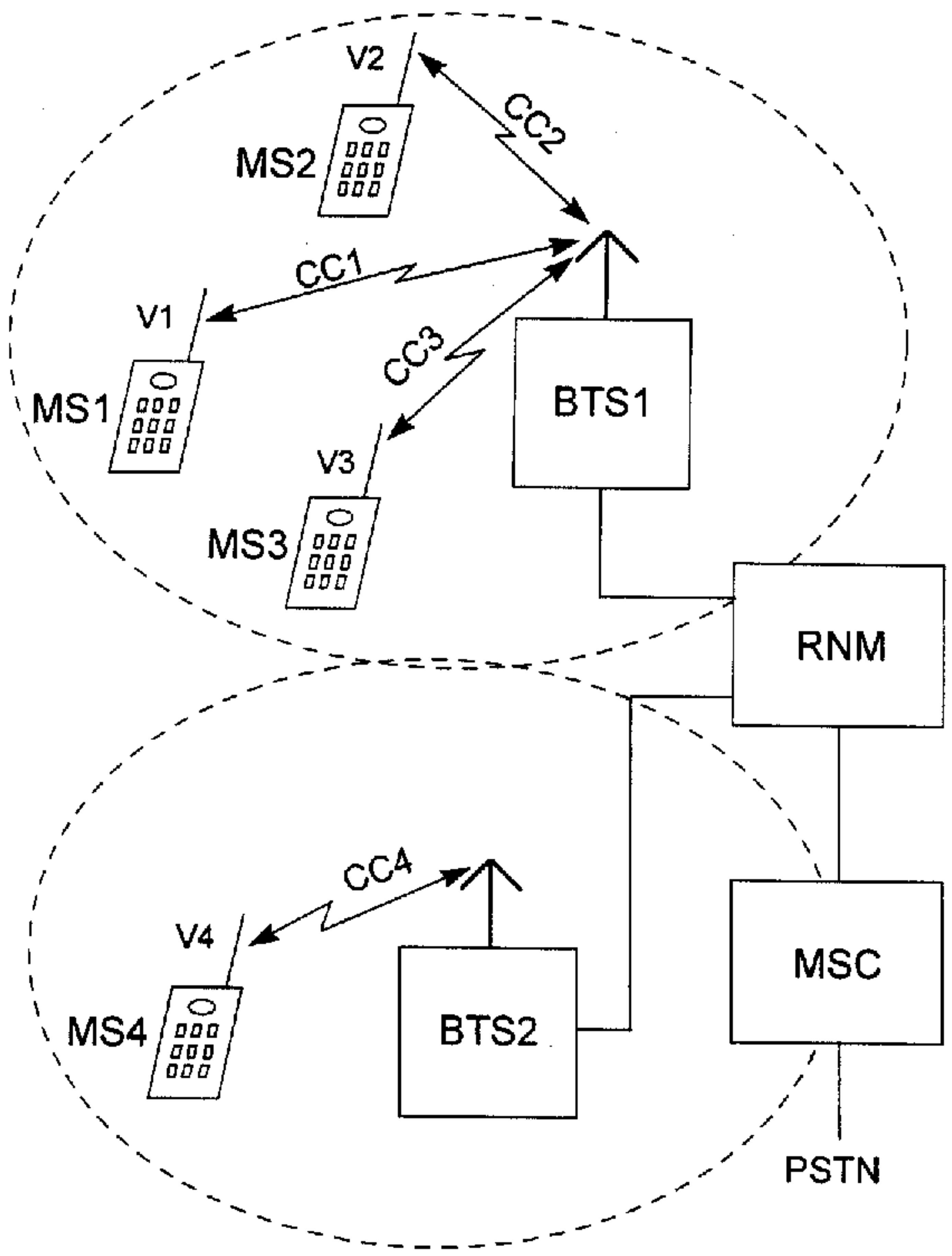
(51) Int.Cl.^{7} H04Q 7/38, H04B 7/26
(30) 1997/09/01 (197 38 156.1) DE

(54) **PROCEDE ET DISPOSITIF DE TRANSMISSION DE DONNEES D'UTILISATEUR DANS UN SYSTEME DE RADIOCOMMUNICATION**

(54) **METHOD AND DEVICE FOR TRANSMITTING USER DATA IN A RADIOCOMMUNICATION SYSTEM**



(57) La présente invention concerne un procédé et un dispositif de transmission de données d'utilisateur pour des canaux de communication en provenance/à destination d'une première et d'une seconde stations se trouvant dans la zone de couverture radioélectrique,

(57) The invention pertains to a method and device for transmitting user data related to communication channels from/to a first and a second station situated in the coverage area, according to the method of CDMA-user separation. The allocation of a first or a second CDMA

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selon le procédé de séparation des utilisateurs-AMCR (accès multiple par code de répartition). Aux première et seconde stations est signalée l'attribution d'un premier ou d'un second code AMCR. En outre, le second code AMCR attribuée à la seconde station est signalé à la première statio, qu ipeu dès lors utiliser les premier et second codes AMCR pour détecter les données d'utilisateur transmises.

code is signalled to the first and the second stations. In addition, the second CDMA code allocated to the second station is signalled to the first statio, which can then use the first and the second CDMA codes to detect transmitted user data.

Abstract

Method and arrangement for transmitting payload data in a radiocommunication system

The invention relates to method and an arrangement for transmitting payload data of communication connections from/to a first and a second radio station, which are located in the radio coverage area of a first base station, according to a CDMA subscriber separation method. An allocation of a first or second CDMA code is signaled to the first and the second radio station, respectively. In addition, the allocation of the second CDMA code to the second radio station is signaled to the first radio station as well, whereupon the first and second CDMA codes is used by the first radio station for detecting the transmitted payload data. **[sic]**

Figure 1

METHOD AND ARRANGEMENT FOR TRANSMITTING PAYLOAD DATA IN A RADIOCOMMUNICATION SYSTEM

The invention relates to a method and an arrangement for transmitting payload data in a radiocommunication system, particularly a mobile radio system.

In communication systems, messages (for instance voice, image information or other data) are transmitted via transmission channels; in radiocommunication systems this is accomplished with the aid of electromagnetic waves via a radio interface. The electromagnetic waves are emitted with carrier frequencies lying in the frequency band that is provided for the respective system. In the GSM mobile radiotelephone system (Global System for Mobile Communication), the carrier frequencies are in the region of 900 Mhz. For future radiocommunication systems, for instance UMTS (Universal Mobile Telecommunication System) or other systems of the 3rd generation, frequencies in the frequency band of ca. 2000 Mhz are provided.

DE 195 49 158 teaches a radiocommunication system that uses a CDMA subscriber separation (CDMA: Code Division Multiple Access), whereby the radio interface additionally comprises a time division multiplex separation (TDMA). In the base stations a joint detection method is used at the receiving side to guarantee a better detection of the transmitted payload data given knowledge of the CDMA codes of several subscribers, since the intracellular interference within a radio coverage area can be almost completely eliminated. It is known that several transmission channels can also be allocated to a communication connection via the radio interface, it being possible to distinguish each transmission channel by an individual CDMA code.

By contrast, in mobile radio stations a detection of the transmitted payload data is performed at the receiving side only on the basis of the allocated CDMA code, since only this is known in the mobile radio station a priori. The CDMA codes of the other subscribers are not known and thus cannot be integrated into the detection as in a joint detection method. The transmitted payload data of the communication connections to the other mobile radio stations are treated as noise, as in the known method of DS CDMA subscriber separation (DS: Direct Sequence).

WO 97/05707 teaches a method for reducing common channel interference in receiving equipment of base and subscriber stations of a cellular radio system. In the radio cells, radio channels with the same frequency are used, whereby a signal transmission is accomplished in accordance with a known JD CDMA method (JD: Joint Detection). The decoding in the respective receiving equipment in one radio cell entails the use, at least in part, of spread codes that are used in at least one other radio cell which uses the same frequency band.

It is the object of the invention to set forth a method and an arrangement that improve the detection capabilities of a mobile radio station. This object is inventively achieved by the method according to the features claimed in patent claim 1, and by the arrangement according to the features claimed in patent claim 12. Advantageous developments of the invention emerge from the subclaims.

In the method for transmitting payload data in a radiocommunication system, payload data of a communication connection is inventively transmitted from/to a first and a second radio station, which are respectively located in a radio coverage area of a first base station. At least one frequency channel having several CDMA codes is allocated to the radio coverage area of the first base station. An allocation of a first or second CDMA code, respectively, is signaled to the first and second radio stations. In addition, the allocation of the second CDMA code to the second radio station is signaled to the first radio station, whereupon the first and second CDMA codes are used by the first radio station for detecting the transmitted payload data.

By this inventive method, the first radio station can additionally use the second CDMA code for detecting the payload data transmitted to the first radio station, whereby the intracellular interference in the first radio station is almost totally eliminated, and the reception quality is increased due to an improved signal/noise ratio (SNR).

In a first development of the invention, the payload data are additionally transmitted within a TDMA subscriber separation method. Here, each radio channel is subdivided into time slots. This subscriber separation method has the advantage that the payload data transmission from and to the radio stations can be accomplished in one frequency channel, a specific number of time slots being used for the upstream direction, and a specific number being used for the downstream direction.

In a further development of the invention, the payload data are detected in the first radio station according to a known joint detection method. By this method, the interference at the location of the first radio station can be almost completely eliminated.

According to another development of the invention, the allocation of the CDMA codes to the first or second radio station, respectively, can occur at the network side and can be signaled by the first base station, or alternatively in that the first and second radio stations select the first or second CDMA code, respectively, and the selection is respectively signaled to the first base station. It is possible to perform a flexible and dynamic allocation of CDMA codes in this way. Furthermore, given allocation at the network side, the CDMA codes can be allocated base-station-wide, whereby the quality of reception is increased when different CDMA codes are used in neighboring radio coverage areas, due to a lower intercellular interference.

In an advantageous development of the invention, the allocation of additional CDMA codes to additional radio stations is also signaled to the first radio station, which codes are additionally used by the first radio station for detecting the payload data transmitted thereto. The additional radio stations are located in the same radio coverage area and/or in a neighboring area, and payload data are respectively transmitted from/to to **[sic]** the additional radio stations in a common frequency channel and/or in a common time slot.

The signaling of the allocation of additional CDMA codes in the neighboring radio coverage areas results in an elevated signal load; however, it makes it possible to further increase the noise margin, and thus to improve the reception quality.

In a further development of the preceding development, only the allocation of the simultaneously active CDMA codes to the additional radio stations is signaled to the first radio station. In this way, it is possible to save computing power in the detection via the joint detection algorithm, to enlarge the noise margin, and to achieve an optimal reception quality given minimal signal processing.

The allocation, or respectively, the signaling of the allocation, to the first radio station can alternatively ensue by a transmission of the respective CDMA codes or by a transmission of code indexes that are allocated to a CDMA code, respectively. According to a first development, the transmitted CDMA codes are stored in a storage device of the first radio station; or respectively, according to a second development, the corresponding CDMA codes are detected by the first radio station with the aid of the code indexes and are stored in a storage device. Since the costs of realizing the storage device in the first radio station are all but negligible, the signaling load can advantageously be significantly reduced by this simple measure.

According to another development of the invention, the allocation of a respective additional CDMA code is signaled to the first radio station when a connection is set up from/to an additional radio station, the payload data of the communication connection from/to the additional radio station being transmitted only upon the successful completion of the signaling to the first radio station. In this way it is advantageously ensured that at all times the first radio station has knowledge of all simultaneously active CDMA codes as soon as these are allocated, and even before they are used by the additional radio stations, thus guaranteeing a constantly high reception quality for the communication connection to the first radio station.

Furthermore, changes of the allocation of the CDMA codes are advantageously signaled to the first radio station when an additional communication connection to an additional radio station is set up or cleared, respectively; when a higher or lower transmission capacity is required for the additional communication connection, respectively; or when a connection takeover is required given the crossing of the additional radio station into a neighboring radio coverage area of another base station. Any modification of the allocation and use of CDMA codes is thereby advantageously signaled to the first radio station.

Exemplifying embodiments of the invention are detailed below with the aid of the enclosed drawings.

Shown are:

Figure 1 a block circuit diagram of a radiocommunication system, particularly a mobile radiotelephone system,

Figure 2 a schematic illustration of the general structure of the radio interface,

Figure 3 a schematic illustration of the construction of a radio block,

Figure 4 a block circuit diagram of the receiver of a radio station,

Figure 5 a signaling flowchart of a connection set-up to an additional radio station.

The radiocommunication system illustrated in Figure 1 corresponds in its structure to a known GSM mobile radiotelephone network that consists of a plurality of mobile switching centers MSC which are interlinked, or respectively, which provided access to a stationary network PSTN. Furthermore, these mobile switching centers MSC are connected to at least one device for allocating radio resources RNM. In turn, each of these devices RNM makes it possible to connect to at least one base station BTS, in this case to a first BTS1 and a second base station BTS2. These base stations BTS1 and BTS2 are radio stations that can set up communication connections to additional radio stations via a radio interface, in this case to mobile radio stations MS1 to MS4.

Figure 1 exemplarily depicts three communication connections V1,V2 and V3 for transmitting payload data and signaling information between the mobile stations MS1,MS2,MS3 and the first base station BTS1, whereby a respective CDMA code CC1,CC2 or CC3 is allocated to each mobile radio station MS1,MS2,MS3 for purposes of detecting the payload data in the respective communication connection V1,V2,V3. A fourth communication connection V4 for transmitting payload data and signaling information between the fourth mobile radio station MS4 and the second base station BTS2 is also illustrated. The CDMA code CC4 is allocated to this fourth mobile radio station MS4 for detecting the payload data.

The functionality of this structure is used by the radiocommnuciatoin system according to the invention; however, it can also be transferred to other radiocommunication systems, such as wireless subscriber access networks, in which the invention can be applied, as it were.

The base stations BTS1 and BTS2 are respectively connected to antenna equipment, which consists of three individual radiators, for example. Each of the individual radiators radiates directionally into a sector of the radio cell that is covered by the respective base station BTS1 or BTS2. But a greater number of individual radiators (according to adaptive antennas) can alternatively be used, so that a spatial subscriber separation according to a CDMA method (Space Division Multiple Access) can also be used.

The general structure of the radio interface can be seen in Figure 2. In accordance with a TDMA component, a splitting of a broadband frequency range, for instance the bandwidth B=1.6 MHz, into several time slots ts, for instance 8 time slots ts1 to ts8, is provided. Each time slot ts in the frequency region B constitutes a frequency channel. Within the frequency channels which are provided for payload transmission, information of several connections is transmitted in radio blocks. In accordance with an FDMA component, several frequency regions B are allocated to the radiocommunication system.

According to Figure 3, these radio blocks for payload data transmission consist of data parts dt with data symbols d, in which segments are embedded having Mittambels m that are known at the receiving side. The data d are spread in a connection-specific manner with a fine structure (a spread code (CDMA code)), so that, for instance, K data channels DK1,DK2,DK3,..,DKK can be separated by this CDMA component at the receiving side. A specific energy E is allocated to each of these data channels DK1,DK2,DK3,..,DKK per symbol at the transmitting side.

The spreading of individual symbols of the data d with Q chips has the effect that, within the symbol duration Ts, Q subsegments of duration Tc are transmitted. The Q chips form the individual CDMA code. The Mittambel m consists of L chips, also of duration Tc. Furthermore, a protection time GUARD of duration Tg is provided in the time slot ts for purposes of compensating varying signal transit times of the connections of consecutive time slots ts.

Within a broadband frequency region B, the consecutive time slots ts are organized according to a general structure. Eight time slots ts are thus combined into one frame, whereby one particular time slot of the frame forms a frequency channel for transmitting the payload data and is used recurrently by a group of connections. Additional frequency channels, for instance for frequency or time synchronization of the mobile radio stations, are not inserted into every frame, but rather at definite times within a multiframe. The spacings between these frequency channels determine the capacity made available by the radiocommunication system for this purpose.

The parameters of the radio interface are as follows, for example:

Duration of a radio block	577 μs
Number of chips per Mittambel m	243
Protection time Tg	32 μs
Data symbols per data part N	33
Symbol duration Ts	6.46 μs
Chips per symbol Q	14
Chip duration Tc	6/13 μs

In the upstream (MS->BTS) and downstream (BTS -> MS) directions, the parameters can also be set differently.

Figure 4 exemplarily details the reception path in a joint detection receiver. The receiver relates to radio stations, which can be base stations as well as mobile radio stations. Figure 4 only illustrates the signal processing for one exemplary communication connection V1.

In the submodule E1 the reception signals are converted from the transmission frequency band into the low-pass region and are split into a real and an imaginary component. In the submodule E2 an analogous low-pass filtering ensues; and lastly, in submodule E3 a two-fold oversampling of the reception signal with 13/3 MHz and a word width of 12 bits ensues.

In submodule E4 a digital low-pass filtering occurs using a filter of the bandwidth 13/6 MHz with optimally high edge steepness for channel separation. The twice oversampled signal then undergoes a 2:1 reduction in the submodule E4.

The resulting reception signal e consists essentially of two parts; namely, a portion em for channel estimation, and the portions e1 and e2 for data estimation. In the submodule E5 all channel impulse responses $h^{(k)}$ are estimated with the aid of a known Mittambel base code m of all the data channels transmitted in the respective time slot.

In the submodule E6 parameters $b^{(k)}$ for matched filters for each data channel are determined using the CDMA codes $c^{(k)}$. In submodule E7 interferences in the reception blocks e1/2 that are used for data estimation, which are caused by the Mittambels $m^{(k)}$, are eliminated. This is possible based on the knowledge of $h^{(k)}$ and $m^{(k)}$.

In submodule E8 the cross-correlation matrix $A^{*T}A$ is calculated. Since $A^{*T}A$ has a Töplitz structure, it is only necessary here to calculate a small part of the matrix, which can then be used to expand to the complete size. In submodule E9 there occurs a Cholesky factorization of A^{*T} A into H^{*T} H, whereby H is an upper triangular matrix. Because of the Töplitz structure of $A^{*T}A$, H also approximately has a Töplitz structure and need not be calculated entirely. A vector s represents the reciprocals of the diagonal elements of H, which can be advantageously used in the equation system solvers.

In the submodule E10 there occurs a matched filtering of the reception symbol series e1/2 with $b^{(k)}$. Submodule E11 realizes the equation system solver 1 for $H^{*T}*z1/2=e1/2$, and submodule E12 realizes the equation system solver 2 for $H*d1/2=z1/2$. In submodule E13 the estimated data d1/2 are demodulated, descrambled, and finally convolution-decoded by means of Viterbi decoders. The decoded data blocks $e^{(k)}_{E13}$ are selectively fed to a first data sink D1 or via the source decoder E14 to a second data sink D2. The source decoding is necessary in data blocks that were transmitted via signalling channels SACCH or FACCH.

According to the inventive subject matter, this receiver is also employed in the first mobile radio station MS1, for example; whereby, besides the allocated first CDMA code CC1, the second CDMA code CC2, which was allocated to the second mobile radio station MS2, is also used in the submodule E6. In Figure 5, a time characteristic of a signaling of an allocation of a CDMA code to the third mobile radio station MS3 is exemplarily illustrated below.

Figure 5 depicts a signaling flowchart with a connection set-up that is initiated by the third mobile radio station MS3, and with a signaling of the allocation of a CDMA code to the third mobile radio station MS3 and a signaling of this allocation to the first mobile radio station MS1, said signaling being performed by the first base station BTS1.

The management of the radio resources in the radio coverage area of the first base station BTS1, particularly of the CDMA codes, exemplarily occurs in the equipment known from Figure 1 for allocating radio resources RNM that is connected to the first base station BTS1. The equipment for allocating radio resources RNM thus also has at its disposal information about the allocation of CDMA codes in the neighboring radio coverage region of a second base station BTS2 and can perform an optimal allocation in order to minimize the intercellular interference between the neighboring radio coverage areas.

The illustrated signaling is based on generally known and standardized GSM signaling, whereby a few signaling messages are enhanced for the inventive method in order to create the additional signaling of the allocation of CDMA codes. In addition to the known GSM signaling, a signaling message "signaling allocation" (CDMA code update) is used for signaling the allocation of a CDMA code to a further mobile radio station, in this case to the third mobile radio station MS3.

In the example of Figure 5, the third mobile radio station MS3, which is located in the radio coverage area of the first base station BTS1 according to Figure 1, initiates a "connection set-up attempt" (random access) on a transmission channel RACH (Random Access Channel) that is reserved for this purpose. An acknowledgment of this "connection set-up attempt" is delivered to the third mobile radio station MS3 by the first base station BTS1 by means of an "access acknowledgment" (access grant). The signaling of the "access acknowledgment" further contains the allocation of a CDMA code CC3 that the third mobile radio station MS3 is to use for detecting additional signaling data. Furthermore, the allocation of the other active CDMA codes – for instance the CDMA code CC1 that is allocated to the first mobile radio station MS1, and the second CDMA code CC2 that is allocated to the second mobile radio station MS2 – as well as a starting point t_0 defining the starting time for using the third CDMA code CC3 can also be transmitted in the signaling message "access acknowledgment".

All active mobile radio stations that are located in the radio coverage area of the first base station BTS1 and that transmit payload data in the same frequency channel and time slot as the third mobile station MS3 are informed about the newly allocated third CDMA code CC3 via the first base station BTS1. The signaling of the allocation of the other CDMA code CC3 to the other active mobile radio stations ensues via a "signaling allocation" (CDMA code update), whereby the example illustrated in Figure 5 is limited to the signaling of the allocation of the new third CDMA code CC3 to the first mobile radio station MS1. In addition, the starting time t_0 for using the third CDMA code CC3 is also transmitted in the signaling messages "signalling allocation" and "access acknowledgment" to the first mobile radio station MS1 and to the third mobile radio station MS3, respectively. With the aid of this signaling, it is possible for the first mobile radio station MS1 to to **[sic]** detect the payload data of the communication connection V1 subsequent to the starting time t_0 using is own allocated first CDMA code CC1, the additional active CDMA codes that are active in the radio coverage area, and the newly allocated third CDMA code CC3.

Once the starting time t_0 has been reached, it is also possible for the third mobile station MS3 to use the allocated third CDMA code CC3 on the signaling channel, whereupon it signals the connection set-up and the number K of desired transmission channels which are characterized by different codes CDMA to the first base station BTS 1 via the signaling message "connection set-up" (SETUP). Given a possible set-up of a connection, the first base station BTS1 then signals a "set-up acknowledgment" (SETUP_ACK), an allocation of new CDMA codes of the desired number K, and a starting time t_1 for using the new CDMA codes, to the third mobile radio station MS3. As described above, the first base station BTS1 in turn signals the allocation of the new CDMA codes, the dismantling of the third CDMA code, and the defined starting time t_1 to the first mobile station MS1. When the starting time t_1 has been attained, the third mobile radio station MS3 can begin the transmission of the payload data to the first base station BTS1 using the K allocated CDMA codes. At the same time, the first mobile radio station MS1 can use the new allocated CDMA codes for the detection of the payload data on the communication connection V1, for instance by the joint detection method.

Patent claims

1. Method for transmitting payload data in a radiocommunication system comprising a first base station (BTS1) and at least a first radio station (MS1) and a second radio station (MS2), which are located in a radio coverage area of the first base station (BTS1), respectively, in which method

- at least one frequency channel having several CDMA codes (CC1,CC2,CC3,...,) is allocated to the radio coverage area of the first base station (BTS1),
- payload data of communication connections (V1,V2) are transmitted from/to the first radio station (MS1) and the second radio station (MS2) according to a CDMA subscriber separation method,

characterized in that

- an allocation of a first CDMA code (CC1) is signaled to the first radio station (MS1), and an allocation of the second CDMA code (CC2) is signaled to the second radio station (MS2), for purposes of detecting the respective payload data,
- the allocation of the second CDMA code (CC2) to the second radio station (MS2) is also signaled to the first radio station (MS1), and
- the first CDMA code (CC1) and the second CDMA code (CC2) are used by the first radio station (MS1) for detecting the transmitted payload data to the first radio station (MS1). **[sic]**

2. Method as claimed in claim 1,

characterized in that

the payload data are additionally transmitted by a TDMA subscriber separation method, in which a frequency channel is divided into several time slots (ts1...).

3. Method as claimed in a preceding claim,

characterized in that the transmitted payload data are detected in the first radio station (MS1) according to a joint detection method.

4. Method as claimed in a preceding claim,
characterized in that the first CDMA code (CC1) and the second CDMA code (CC2) are allocated to the first radio station (MS1) and the second radio station (MS2), respectively , at the network side and are signaled by the first base station (BTS1).

5. Method as claimed in one of the claims 1 to 3,
characterized in that the first CDMA code (CC1) is selected by the first radio station (MS1), and the second CDMA code (CC2) is selected by the second radio station (MS2), and the selection is signaled to the first base station (BTS1), respectively.

6. Method as claimed in a preceding claim,
characterized in that
- the allocation of additional CDMA codes (CC3,...) to additional radio stations (MS3...) that are located in the same radio coverage area and/or in a respectively adjacent coverage area, from/to which stations payload data are respectively transmitted in a common frequency channel and/or in a common time slot, is signaled to the first radio station (MS1), and
- the additional CDMA codes (CC3...) are additionally used by the first radio station (MS1) for detecting the transmitted payload data.

7. Method as claimed in the preceding claim,
characterized in that only the allocation of the simultaneously active additional CDMA codes (CC3...) to additional radio stations (MS3...) is signaled to the first radio station (MS1).

8. Method as claimed in a preceding claim,
characterized in that

– the allocation, or respectively, the signaling of the allocation, ensues by a transmission of the respective CDMA code (CC1,CC2,CC3) to the first radio station (MS1), and

– the CDMA codes (CC1,CC2,CC3,...) are stored in a storage device of the first radio station (MS1).

9. Method as claimed in one of the claims 1 to 7,

characterized in that

– the allocation, or respectively, the signaling of the allocation, ensues by a transmission of code indexes (c1,c2,c3...) that are respectively allocated to a CDMA code (CC1,CC2,CC3...) to the first radio station (MS1), and

– with the aid of the code indexes (c1,c2,c3...), the first radio station (MS1) detects the respectively corresponding CDMA codes (CC1,CC2,CC3,...) that are stored in a storage device in the first radio station (MS1).

10. Method as claimed in a preceding claim,

characterized in that

– in the set-up of a connection from/to an additional radio station (MS3,...), the allocation of a respectively additional CDMA code (CC3,...) is signaled to the first radio station (MS1), and

– the payload data of the additional communication connection (V3...) are transmitted from/to the additional radio station (MS3...) only after the additional CDMA code (CC3...) has been signaled to the first radio station (MS1).

11. Method as claimed in a preceding claim,

characterized in that the allocation, or respectively, the enabling of an additional CDMA code (CC3...) is signaled to the first radio station (MS1) when an additional communication connection (V3..) to an additional radio station (MS3...) is set up or cleared down, respectively; if a higher or lower transmission capacity is required for the additional communication connection (V3...), respectively; or if a connection handover is required consequent to the crossing of the additional radio station (MS3) into a neighboring radio coverage area of a second base station (BTS2).

~~12. Arrangement for carrying out the method as claimed in claim 1,~~
characterized by a first base station (BTS1) and at least a first radio station (MS1) and a second radio station (MS2), which are located in a radio coverage area of the first base station (BTS1), respectively.

13. Arrangement as claimed in claim 12,
characterized by
additional radio stations (MS3...) that are located in the radio coverage area of the first base station (BTS1) and/or in an adjacent radio coverage area of a second base station (BTS2).

14. Arrangement as claimed in claim 12 or 13,
characterized in that
a storage device for storing CDMA codes (CC1,CC2,CC3...) is realized in the radio stations (MS1,MS2,MS3), respectively.

15. Arrangement as claimed in one of the claims 12 to 14,
characterized in that the radiocommunication system is realized as a mobile radiotelephone system whereby the first base station (BTS1) is constructed as a base station, and the radio stations (MS1,MS2,MS3...) are constructed as mobile radio ~~stations, respectively.~~

~~Patent claims~~

12. Radiocommunication system for transmitting payload data, comprising a first base station (BTS1) and at least a first (MS1) and a second (MS2) radio station, which are located in a radio coverage area of the first base station (BTS1); whereby, at least one frequency channel having several CDMA codes (CC1,CC2,CC3...) is allocated to the radio coverage area of the first base station (BTS1), and payload data of communication connections (v1,V2) are transmitted from/to the first radio station (MS1) and the second radio station (MS2) according to a CMA subscriber separation method,

characterized in that

- the first base station (BTS1) comprises means for allocating a first CDMA code (CC1) to the and a second CDMA code (CC2) to the first radio station (MS1) and the second radio station (MS2), respectively, for purposes of detecting the respective payload data;
- the first base station (BTS1) comprises means for signaling the allocation of the first CMA code (CC1) and of the second CDMA code (CC2) to the first radio station (MS1) and to the second radio station (MS2), respectively, and for additionally signaling to the first radio station (MS1) the allocation of the second CDMA code (CC2) to the second radio station (MS2), and
- the first radio station (MS1) comprises means for detecting the payload data transmitted thereto with the aid of the first (CC1) and second (CC2) CDMA codes.

13. Radiocommunication system as claimed in claim 12,

characterized by

additional radio stations (MS3,...,) that are located in the radio coverage area of the first base station (BTS1) and/or in an adjacent radio coverage area of a second base station (BTS2).

14. Radiocommunication system as claimed in claim 12 or 13, characterized in that a storage device for storing CMA codes (CC1,CC2,CC3) is realized in the radio stations (MS1,MS2,MS3,...), respectively.

15. Radiocommunication system as claimed in one of the claims 12 to 14, characterized in that the radiocommunication system is realized as a mobile radiotelephone system, whereby the first base station (BTS) is constructed as a base station, and the radio stations (MS1,MS2,MS3,...) are constructed as mobile radio stations, respectively.

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FIG 1

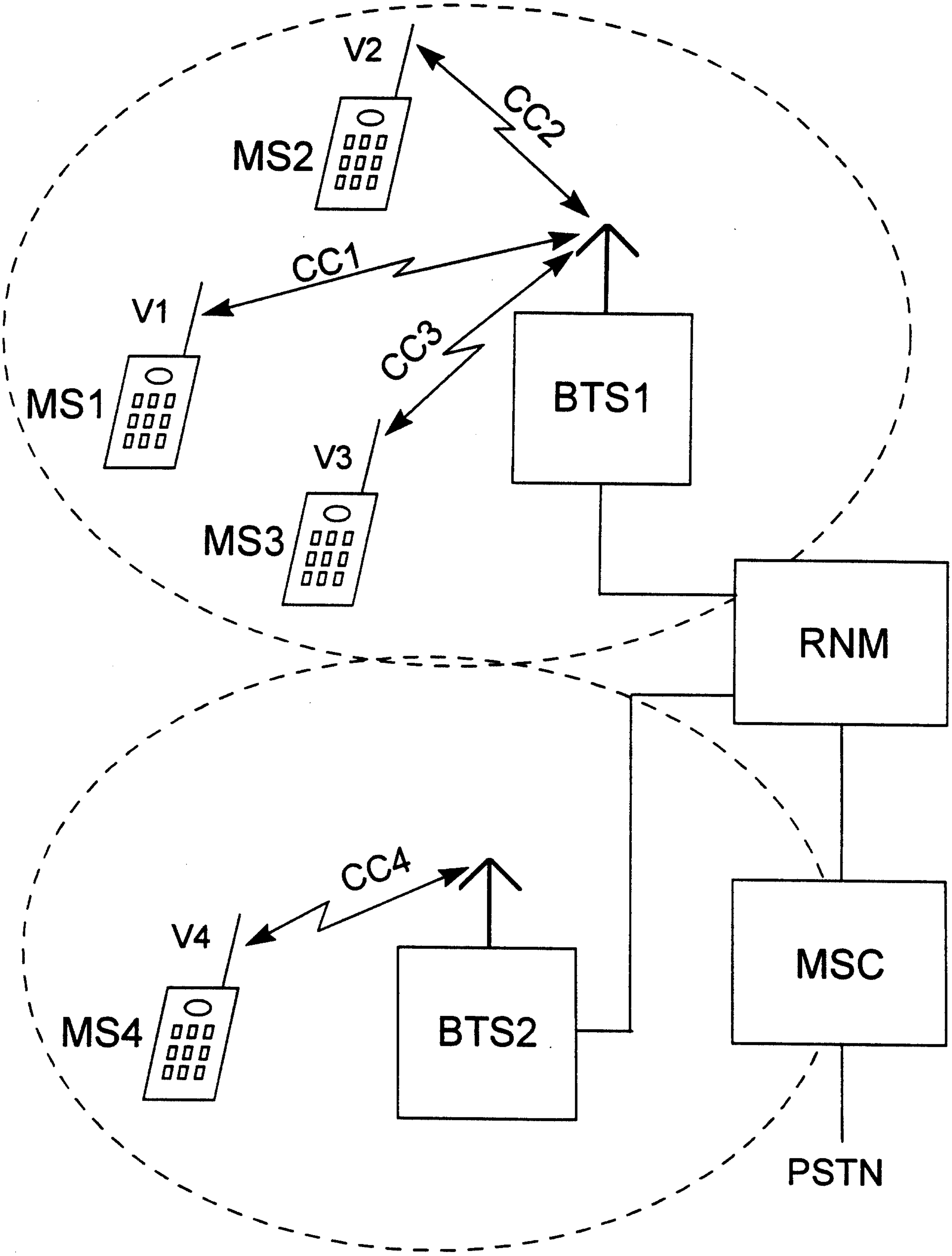

V2
CC2
MS2
CC1
V1
CC3
MS1
BTS1
V3
MS3
RNM
CC4
V4
MSC
BTS2
MS4
PSTN

FIG 2

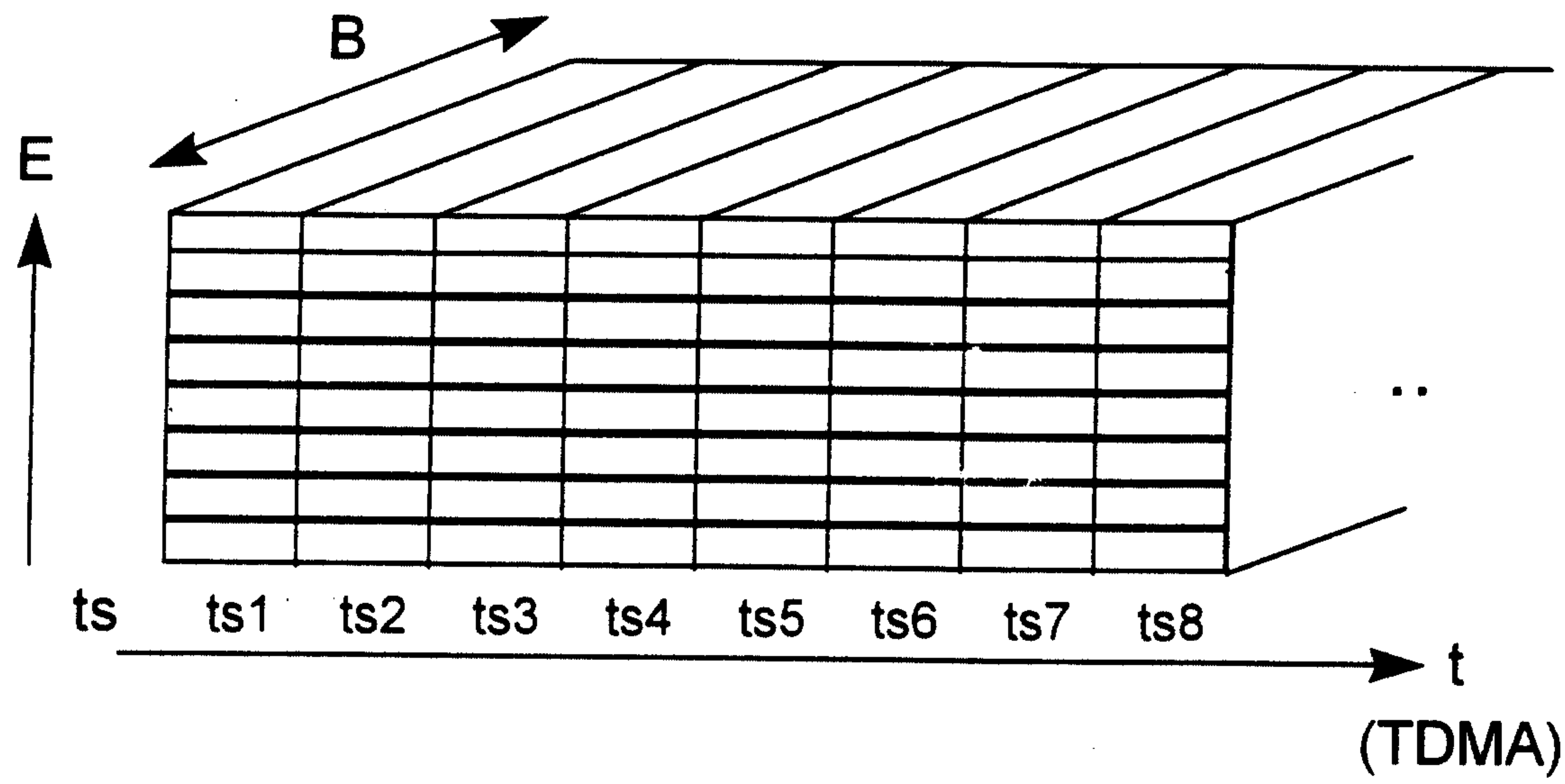

B
E
ts
ts1
ts2
ts3
ts4
ts5
ts6
ts7
ts8
t
(TDMA)

FIG 3

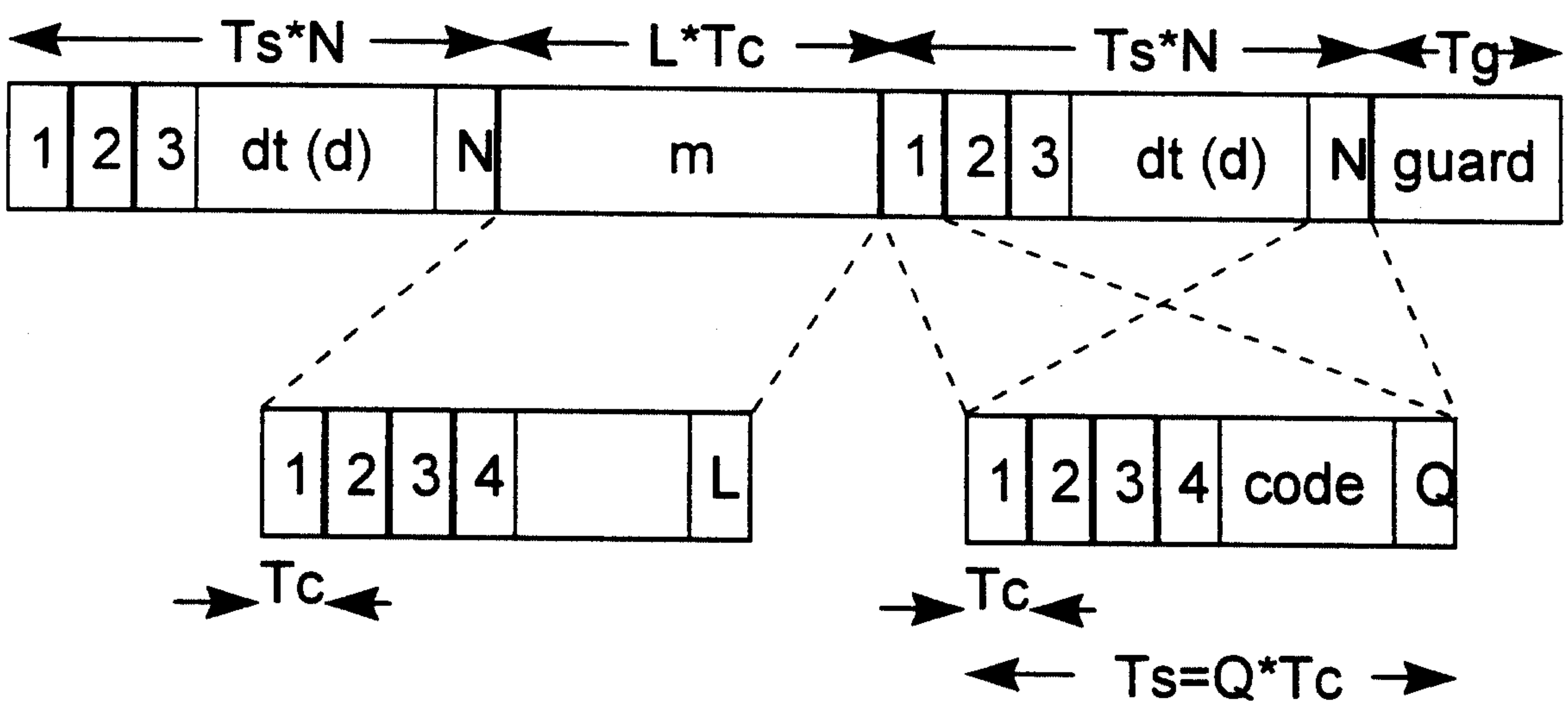
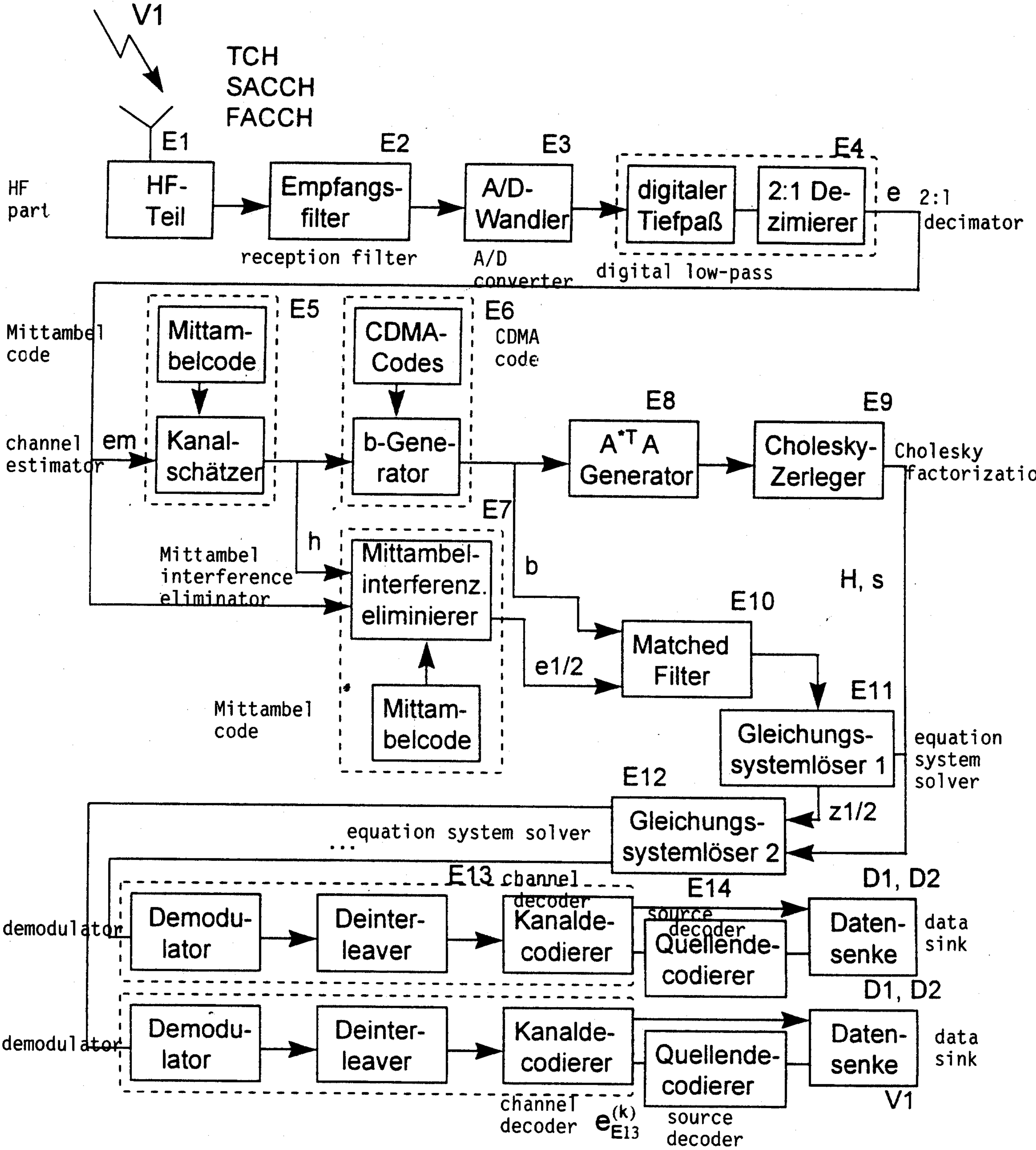
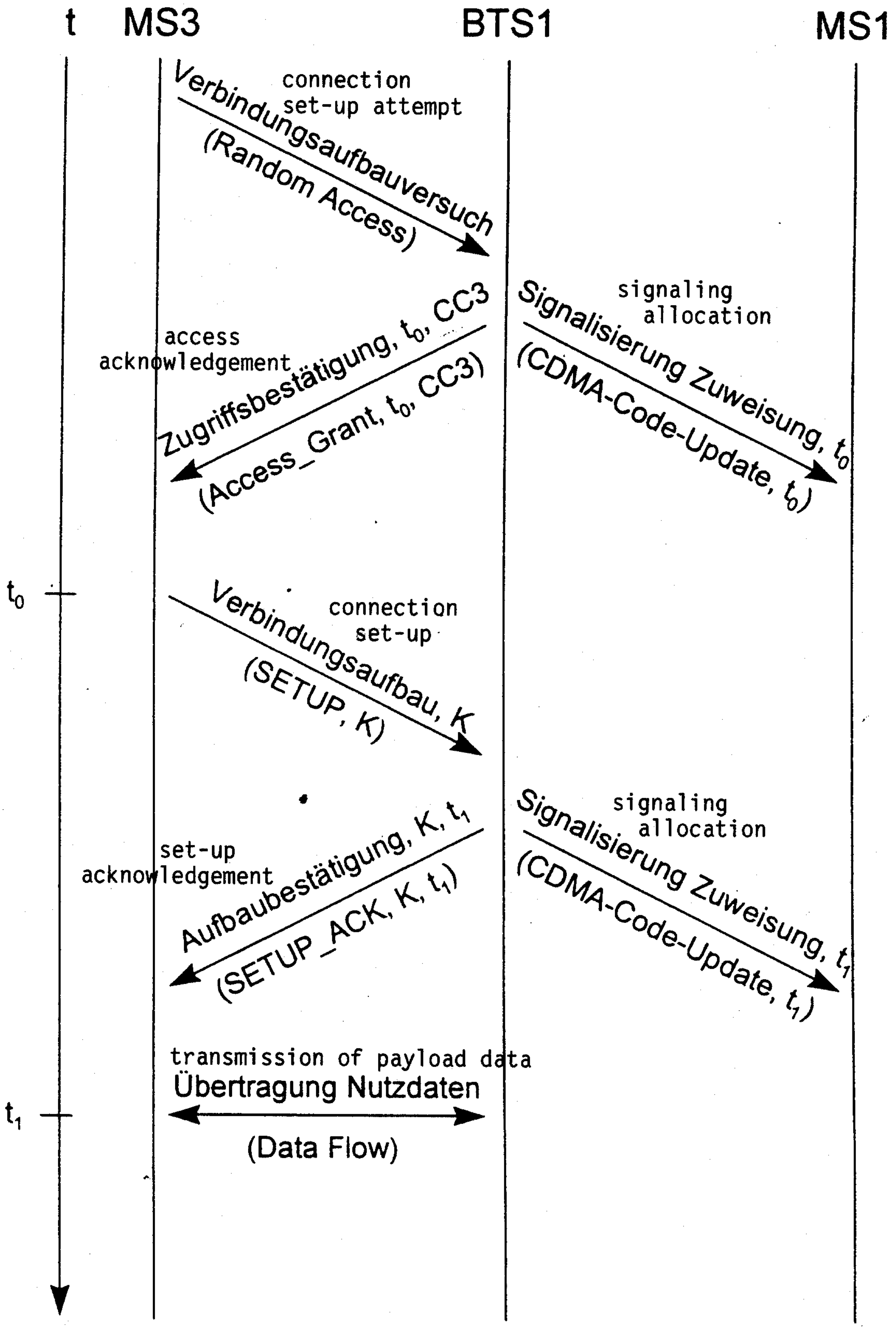

Ts*N
L*Tc
Ts*N
Tg
1
2
3
dt (d)
N
m
1
2
3
dt (d)
N
guard
1
2
3
4
L
Tc
1
2
3
4
code
Q
Tc
Ts=Q*Tc

FIG 4



V1
TCH
SACCH
FACCH
E1
HF part
HF-Teil
E2
Empfangs-filter
reception filter
E3
A/D-Wandler
A/D converter
E4
digitaler Tiefpaß
digital low-pass
2:1 De-zimierer
e
2:1 decimator
Mittambel code
E5
Mittam-belcode
channel estimator
em
Kanal-schätzer
E6
CDMA code
CDMA-Codes
b-Gene-rator
E7
E8
A*T A Generator
E9
Cholesky-Zerleger
Cholesky factorization
h
Mittambel interference eliminator
Mittambel-interferenz. eliminierer
b
H, s
E10
Matched Filter
e1/2
Mittambel code
Mittam-belcode
E11
Gleichungs-systemlöser 1
equation system solver
E12
Gleichungs-systemlöser 2
equation system solver
z1/2
E13
channel decoder
E14
source decoder
D1, D2
demodulator
Demodu-lator
Deinter-leaver
Kanalde-codierer
Quellende-codierer
Daten-senke
data sink
D1, D2
demodulator
Demodu-lator
Deinter-leaver
Kanalde-codierer
Quellende-codierer
Daten-senke
data sink
V1
channel decoder
source decoder

FIG 5


t
MS3
BTS1
MS1
connection set-up attempt
Verbindungsaufbauversuch
(Random Access)
access acknowledgement
Zugriffsbestätigung, t_0, CC3
(Access_Grant, t_0, CC3)
signaling allocation
Signalisierung Zuweisung, t_0
(CDMA-Code-Update, t_0)
t_0
connection set-up
Verbindungsaufbau, K
(SETUP, K)
set-up acknowledgement
Aufbaubestätigung, K, t_1
(SETUP_ACK, K, t_1)
signaling allocation
Signalisierung Zuweisung, t_1
(CDMA-Code-Update, t_1)
transmission of payload data
Übertragung Nutzdaten
t_1
(Data Flow)