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Title: Draft overview text of the FDD DS-CDMA and TDD TD-CDMA radio interface to be inserted in ITU-R IMT.RSPC

Document for: Comments

This document is an update of Tdoc R4-363 containing also material for the TDD mode (differences with Tdoc R4-363 are outlined by revision marks). It was circulated through the ITU AH reflector at the end of last week. It is still a draft contribution submitted to WG4 for comments, according to the process agreed at the last RAN plenary. For additional information on the process, refer to the text in italic at the beginning of Tdoc R4-363.

Introduction

ITU-R TG8/1 are developing the recommendation of the IMT-2000 radio specifications. TG8/1 have requested information from the different specifications groups on their specific radio interfaces. This document contains a first proposal of material for the FDD DS-CDMA and the TDD TD-CDMA radio interface. The material contained in this document is to be reviewed by the different working groups of TSG RAN.

Attachment 1 contains the suggested overview text of the FDD DS-CDMA as well as TDD TD-CDMA section in ITU-R draft recommendation [IMT.RSPC].

Note that the text used in this overview is based on, and large parts taken from, the specifications as of the TSG RAN#4 meeting held in Miami in June. The documents used to compile the overview have been TS25.201v2.1.0, TS25.211v2.1.0, TS25.221v1.1.1a, TS25.212v1.1.0, TS25.222v1.1.0, TS25.213v2.1.0, TS25.223v2.1.1a, TS25.301v3.0.1, TS25.321v2.1.0 and TS 25.401v1.1.1. Only material intended for release'99 has been used. Since the chip rate was changed during the Miami meeting the specifications have not yet been updated. When the specifications have been updated to reflect the change of chip rate, this text has to be revised accordingly. It should mainly concern the text describing the physical layer for FDD.

Note also that in Attachment 2, the table showing the major technical parameters is an initial proposal that could create some discussions in the different working groups of what are the **major** technical parameters. Especially, WG4 issues should be covered here since RF issues are not really included in the text of attachment 1.

Attachment 1: Draft overview of FDD DS-CDMA and TDD TD-CDMA radio interface + major technical parameter table

Attachment 2: Proposed major technical parameters table

Attachment 3: An extract of the guidelines from ITU-R TG8/1.

ATTACHMENT 1

5.x.2 Overview of the ~~FDD DS-CDMA~~ radio interface

5.x.2.1 Introduction

For FDD and TDD ~~T~~the radio access scheme is Direct-Sequence Code Division Multiple Access (DS-CDMA) and Time Divison Code Division Multiple Access (TD-CDMA), respectively, with information spread over approximately 5 MHz bandwidth with a chip rate of 3.84 Mcps, thus the FDD mode also often denoted as Wide-band CDMA (WCDMA) due to that nature. The technology employs both, frequency division duplex (FDD) and time division duplex (TDD). It is defined to carry a wide range of user data services (multimedia, packet etc.) simultaneously multiplexed on a single carrier. The specifications are developed and specified within the 3GPP organisation.

The overall architecture is briefly introduced in Section 5.x.2.2. Then the description continues with an overview on the radio protocol layers that are relevant for the radio access specific parts, i.e. the physical layer, layer 2 and radio resource layer 3 of the radio interface.

5.x.2.2 Architecture

The overall architecture of the system is shown in Figure 1.

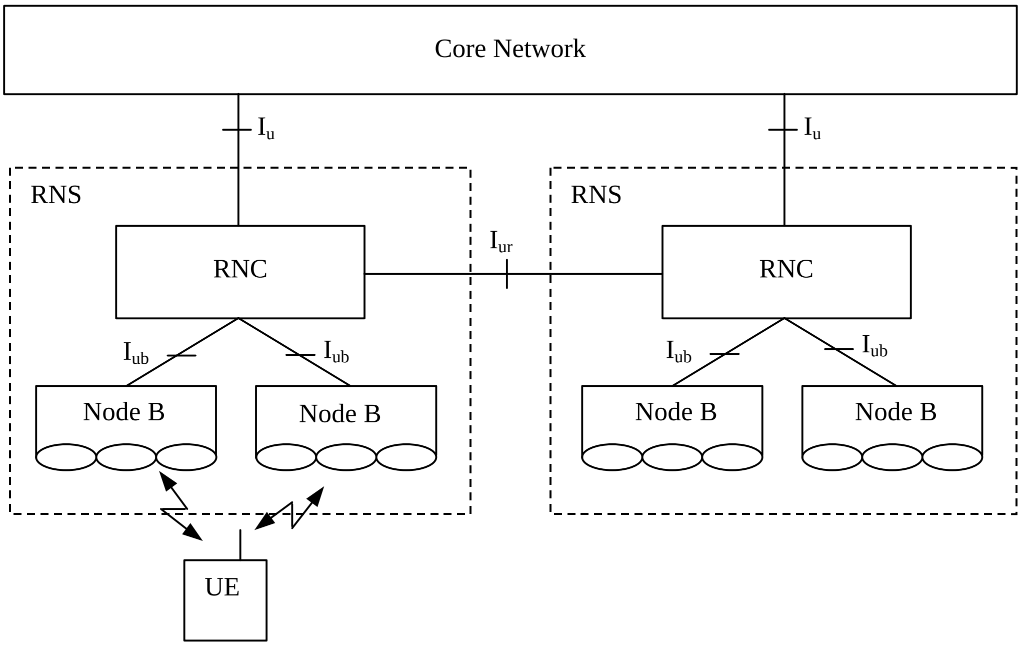

Figure 1. UTRAN Architecture

The Universal Terrestrial Radio Access Network (UTRAN) architecture consists of a set of Radio Network Subsystems (RNS) connected to the Core Network through the I_u interface.

A RNS consists of a Radio Network Controller (RNC) and one or more entities called Node B. Node B are connected to the RNC through the I_{ub} interface. Node B can handle one or more cells (indicated by egg-shaped circles).

The RNC is responsible for the handover decisions that require signalling to the User Equipment (UE).

In case macro diversity between different Node B is used ~~T~~the RNC comprises a combining/splitting function to support it~~macro diversity between different Node B~~.

The Node B can comprise an optional combining/splitting function to support macro diversity inside a Node B.

Inside the UTRAN, the RNCs of the Radio Network Subsystems can be interconnected together through the I_{ur}. The I_u and I_{ur} are logical interfaces. I_{ur} can be conveyed over physical direct connection between RNCs or via any suitable transport network.

Figure 2 shows the radio interface protocol architecture for the radio access network. On a general level, the protocol architecture is similar to the current ITU-R protocol architecture as described in ITU-R recommendation M.1035. Layer 2 is split into two sublayers, Radio Link Control (RLC) and Medium Access Control (MAC). Layer 3 and RLC are divided into Control (C-) and User (U-) planes.

In the C-plane, Layer 3 is partitioned into sublayers where the lowest sublayer, denoted as Radio Resource Control (RRC), interfaces with layer 2. The higher layer signalling such as Mobility Management (MM) and Call Control (CC) are assumed to belong to the core network. There are no L3 in UTRAN for the U-plane.

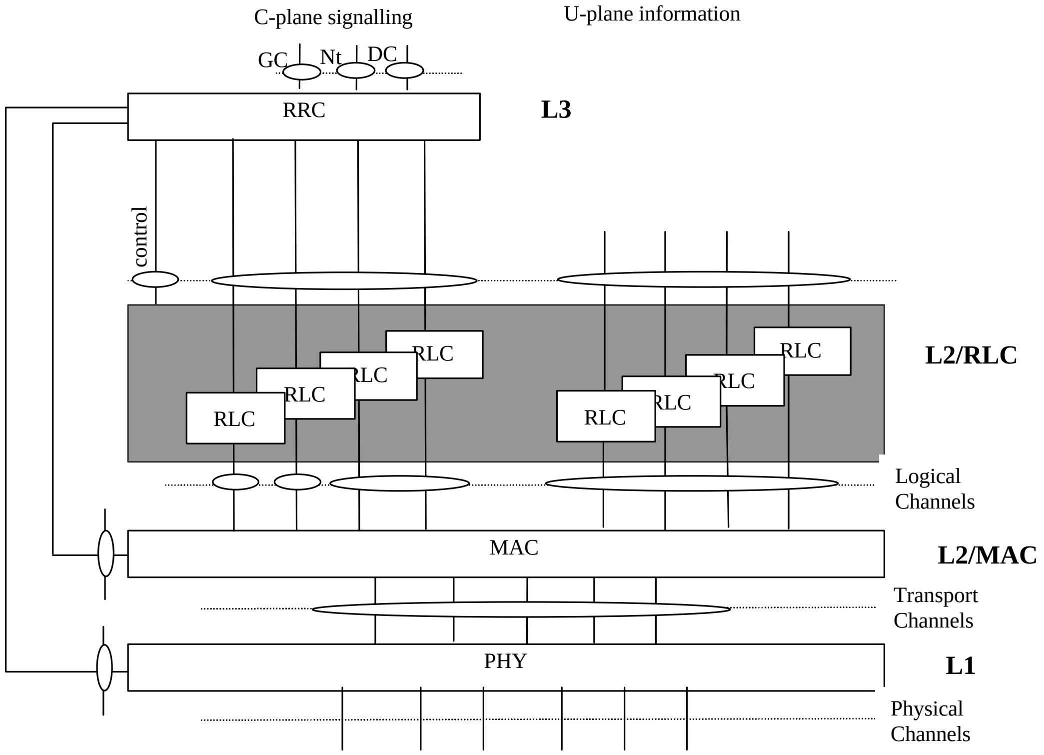

Figure 2. Radio interface protocol architecture of the RRC sublayer, L2 and Physical layer (L1).

Each block in Figure 2 represents an instance of the respective protocol. Service Access Points (SAP) for peer-to-peer communication are marked with circles at the interface between sublayers. The SAPs between RLC and the MAC sublayer provide the logical channels. The type of information transferred characterises a logical channel. The logical channels are divided into control channels and traffic channels. The different types are not further described in this overview. The SAP between MAC and the physical layer provides the transport channels. A transport channel is characterised by how the information is transferred over the radio interface, see Section 5.x.2.3.2 for an overview of the types defined. The physical layer generates the physical channels that will be transmitted over the air. A physical channel corresponds to a specific raw bit rate which is described in FDD using the parameters carrier frequency, code, and, on the uplink, relative phase (0 or $\pi/2$). In TDD using the parameters carrier frequency, code, time slot and multi-frame information. In the C-plane, the interface between RRC and higher L3 sublayers (CC, MM) is defined by the General Control (GC), Notification (Nt) and Dedicated Control (DC) SAPs. These SAPs are not further discussed in this overview.

Also shown in the figure are connections between RRC and MAC as well as RRC and L1 providing local inter-layer control services (including measurement results). An equivalent control interface exists between RRC and the RLC sublayer. These interfaces allow the RRC to control the configuration of the lower layers. For this purpose separate Control SAPs are defined between RRC and each lower layer (RLC, MAC, and L1).

Figure 3 shows the general structure and some additional terminology definitions of the channel formats at the various sublayer interfaces indicated in Figure 2. The figure indicates how higher layer Service data Units (SDU) and Protocol Data Units (PDUs) are segmented and multiplexed to transport blocks to be further treated by the physical layer. The transmission chain of the physical layer is described in the next section.

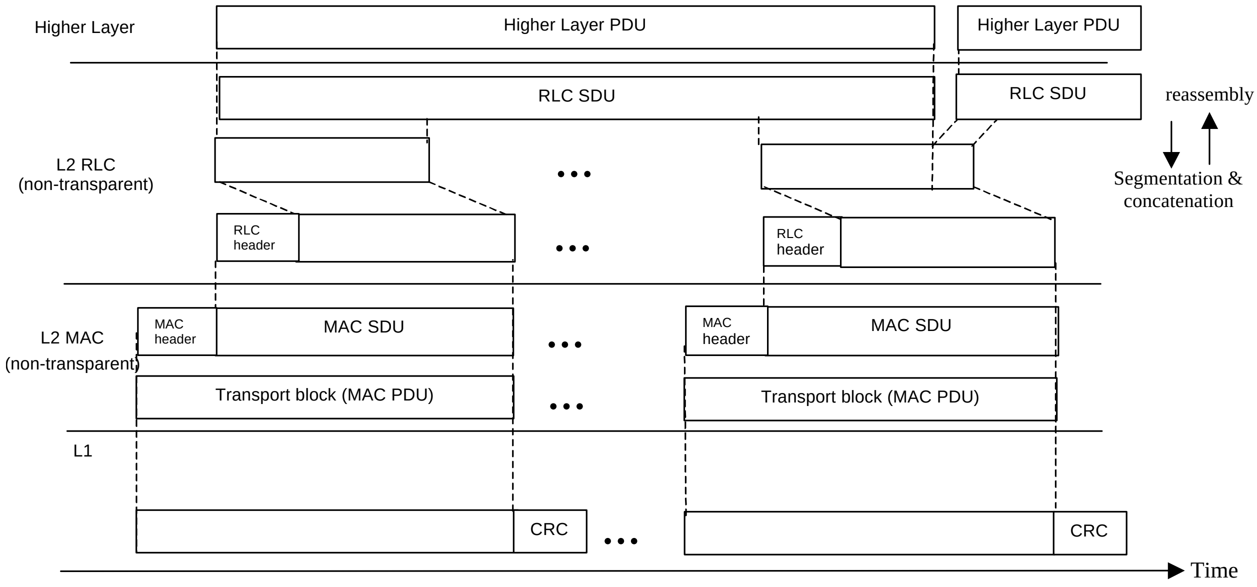

Figure 3. Data flow for a service using a non-transparent RLC and non-transparent MAC, see sections 5.x.2.4.1-2 for further definitions of the MAC and RLC services and functionality.

5.x.2.3 Physical layer

5.x.2.3.1 Physical layer functionality and building blocks

The physical layer includes the following functionality:

- Macrodiversity distribution/combining and soft handover execution
- Error detection on transport channels and indication to higher layers
- Forward Error Control (FEC) encoding/decoding of transport channels
- Multiplexing of transport channels and demultiplexing of coded composite transport channels
- Rate matching (data multiplexed on Dedicated Channels (DCH))
- Mapping of coded composite transport channels on physical channels
- Power weighting and combining of physical channels
- Modulation and spreading/demodulation and despreading of physical channels
- Frequency and time (chip, bit, slot, frame) synchronisation
- Radio characteristics measurements including Frame Error Rate (FER), Signal-to-Interference (SIR), Interference Power Level etc., and indication to higher layers
- Closed-loop power control
- Radio Frequency (RF) processing

Figure 4 gives the physical layer transmission chain for the user plane data, i.e. from the level of transport channels down to the level of physical channel. The figure shows how several transport channels can be multiplexed onto one or more dedicated physical data channels (DPDCH).

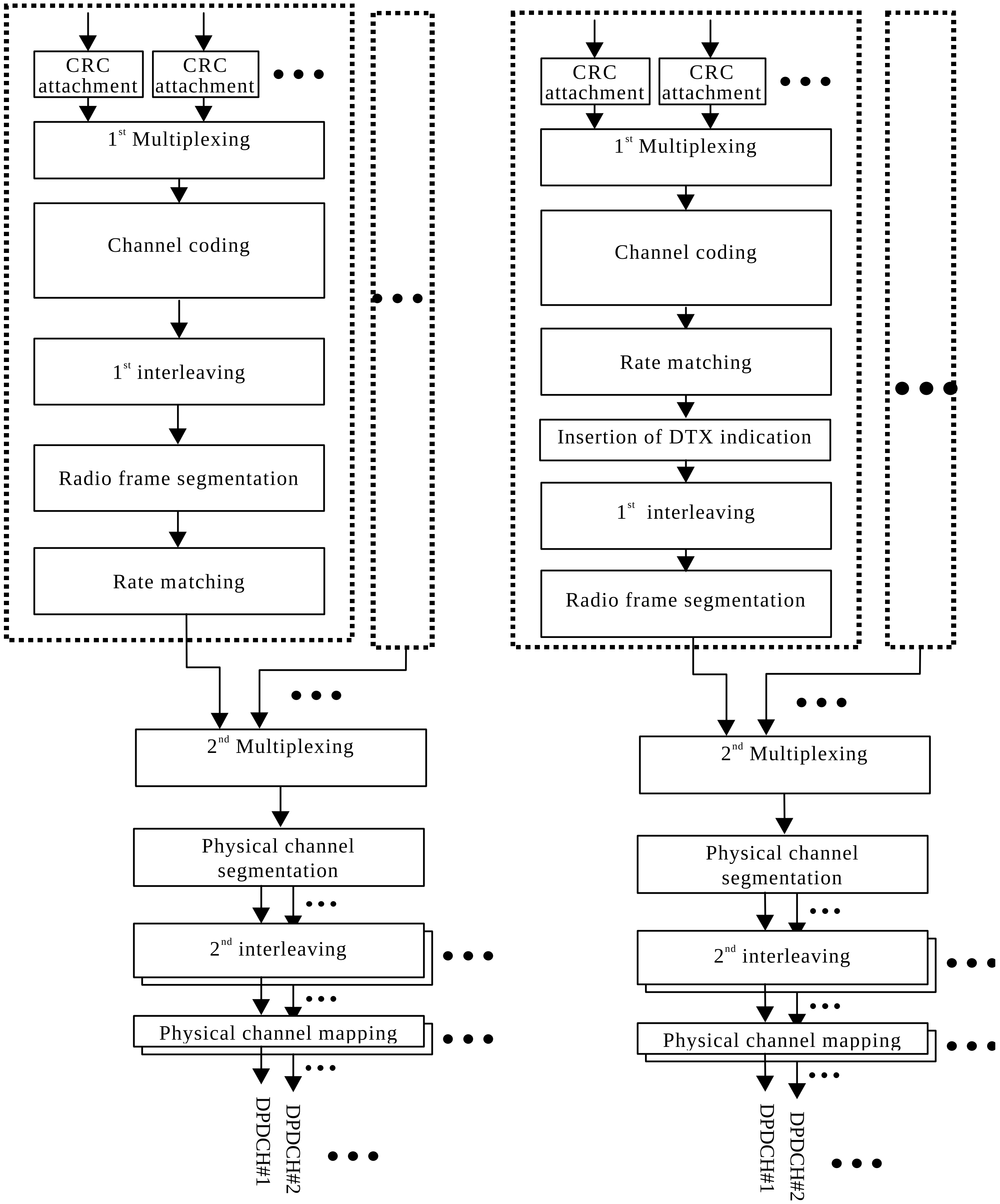

Figure 4. Transport channel multiplexing structure: uplink (left) and the downlink (right).

The cyclic redundancy check (CRC) provides for error detection of the transport blocks for the particular transport channel. The CRC can take the length zero (no CRC), 8 or 16 depending on the service requirements.

The 1st multiplexing may perform the multiplexing of fixed rate transport channels with the same level of quality of service.

The types of channel coding defined are convolutional coding, turbo coding and no ~~service-specific~~ coding. ~~The latter is used for some type of speech codecs that need unequal error protection.~~ Real-time services use only FEC encoding while non real-time services uses a combination of FEC and ARQ. The ARQ functionality resides in the RLC layer of Layer 2.

The rate matching adapts any remaining differences of the bit rate so the number of outgoing bits fit to the available bit rates of the physical channels. Employing repetition coding and/or puncturing do it.

The 2nd multiplexing stage combines transport channels in a serial fashion. The output of this operation is also called coded composite transport channels.

If several physical channels will be used to transmit the data, the split is made in the physical channel segmentation unit.

In the FDD downlink discontinuous transmission (DTX) on a slot to slot basis can be used for variable rate transmission. This is controlled by the ‘Insertion of DTX indication’ box.

5.x.2.3.2 Transport channels and physical channels

The interface to the MAC layer is the transport channels, see Figure 1. The transport channels define how and with which type of characteristics the data is transferred by the physical layer. They are categorised into dedicated channels or common channels where many UEs are sharing the latter type. Introducing an information field containing the address then does the address resolution, if needed. The physical channel itself defines a dedicated channel. Thus no specific address is needed for the UE. Table 1 summarises the different types of available transport channels.

Table 1. The defined transport channels and intended use.

Transport channel	Type and direction	Used for
DCH (Dedicated channel)	Dedicated; uplink and downlink	User or control information to an UE (entire cell or part of cell (lobe-forming))
FAUCH (Fast uplink signalling channel)	Dedicated; uplink	FDD only. Carries control information from an UE
BCH (Broadcast channel)	Common; downlink	Broadcast system and cell specific information
FACH (Forward access channel)	Common; downlink	Control information when system knows UE location or short user packets to an UE
PCH (Paging channel)	Common; downlink	Control information to UEs when good sleep mode properties are needed, e.g. idle mode operation
RACH (Random access channel)	Common; uplink	Control information or short user packets from an UE
CPCH (Common packet channel)	Common; uplink	FDD only. Short and medium sized user packets. Always associated with a downlink channel for power control
DSCH (Downlink shared channel)	Common; downlink	Carries dedicated user data and control information using a shared channel.
USCH (Uplink shared channel)	Common; uplink	TDD only. Carries dedicated user data and control information using a shared channel

The random access and common packet channels on the uplink are contention-based while the dedicated channels are reservation-based.

The transport channels are mapped onto the physical channels. Figure 5 (FDD) and Figure 6 (TDD) show~~s~~ the different physical channels and summarises the mapping of transport channels onto physical channels. Each physical channel has its tailored slot content. The dedicated channel (DCH) is shown in section 5.x.2.3.3.

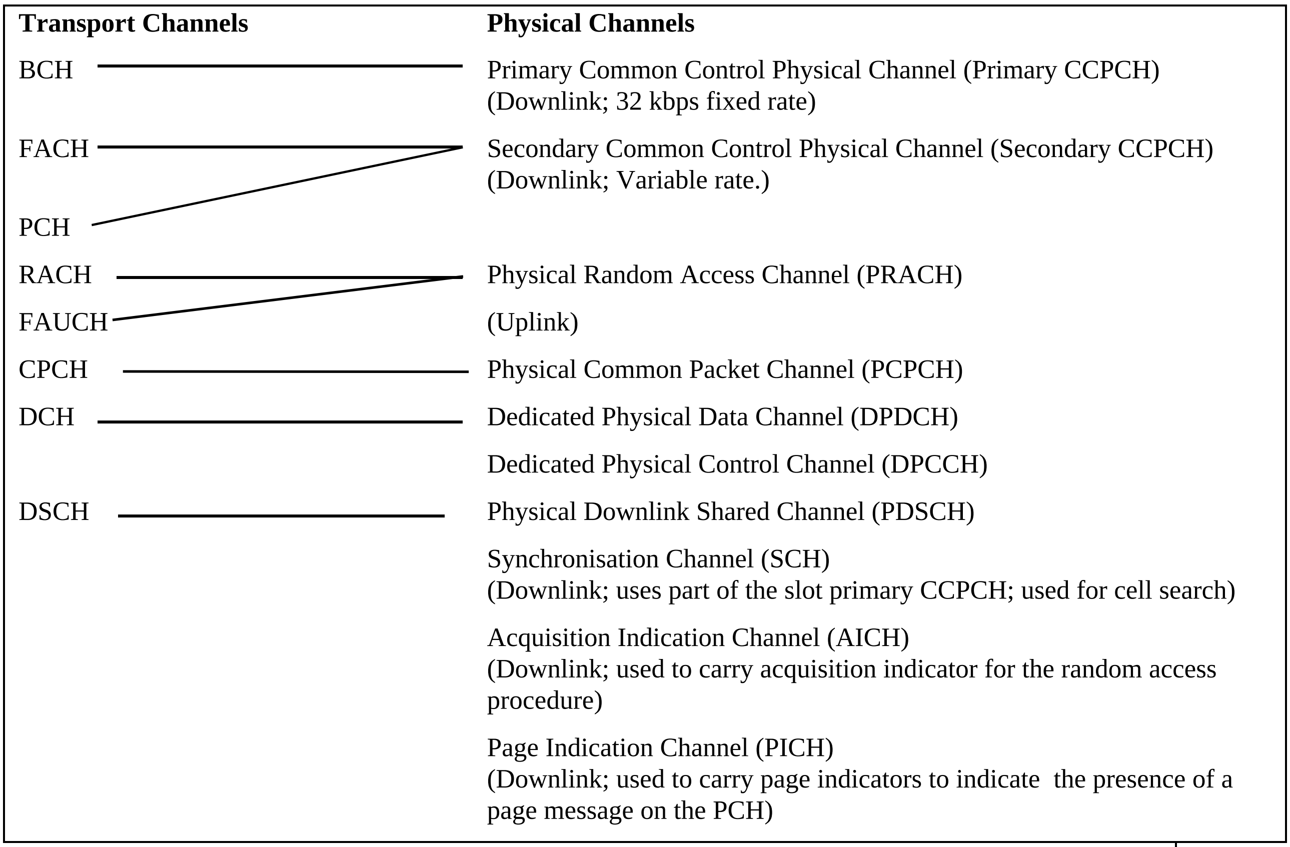

Figure 5: Transport-channel to physical-channel mapping - FDD~~.~~

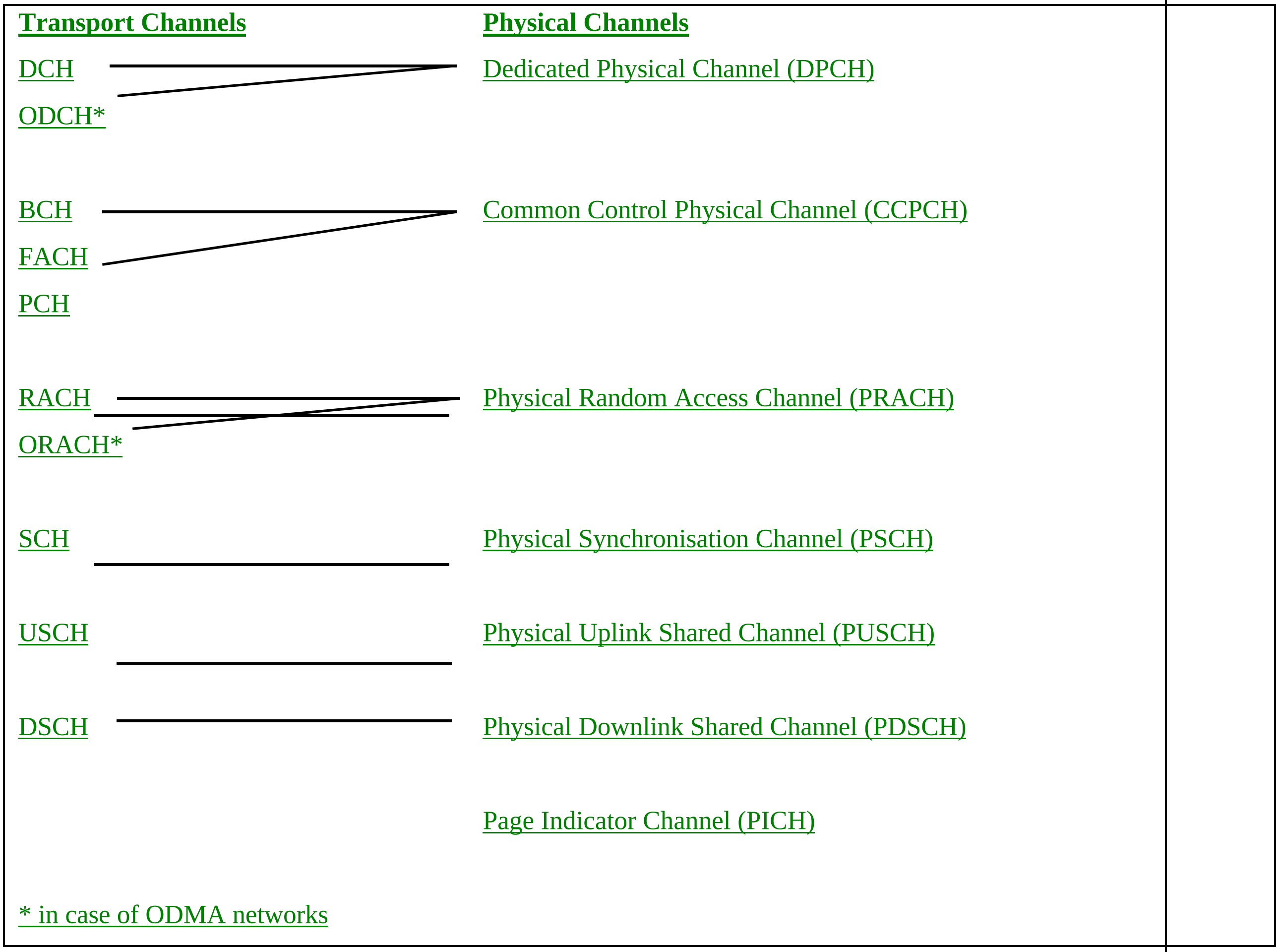

Figure 6 Transport channel to physical channel mapping - TDD

5.x.2.3.3 Physical frame structure - FDD

The basic physical frame rate is 10 milliseconds with 1~~6~~5 slots. Figure 7 shows the frame structure.

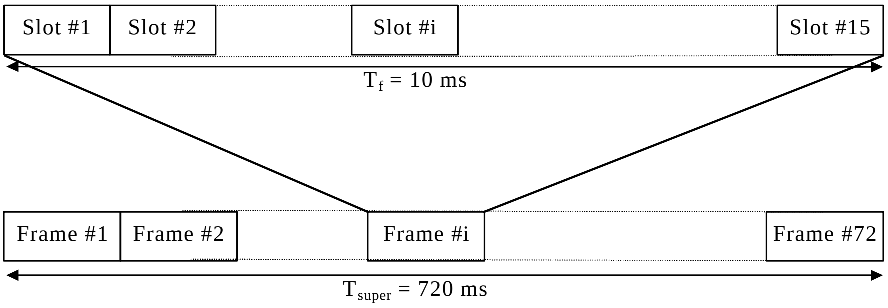

Figure 7. Basic frame structure.

Figure ~~6~~8 shows the content for a slot used by the DCH. For the FDD the uplink physical channels DPDCH and DPCCH are I/Q multiplexed while the downlink channel is time multiplexed. The DPDCH, the channel where the user data is transmitted on, is always associated with a DPCCH containing control information. The Transport Format Combination Indicator (TFCI) field is used for indicating the demultiplexing scheme of the data stream. The TFCI field does not exist for combinations that are static (i.e. fixed bit rate allocations). The Feedback Information (FBI) field is used for transmit and site diversity functions. The Transmit Power Control (TPC) bits are used for power control.

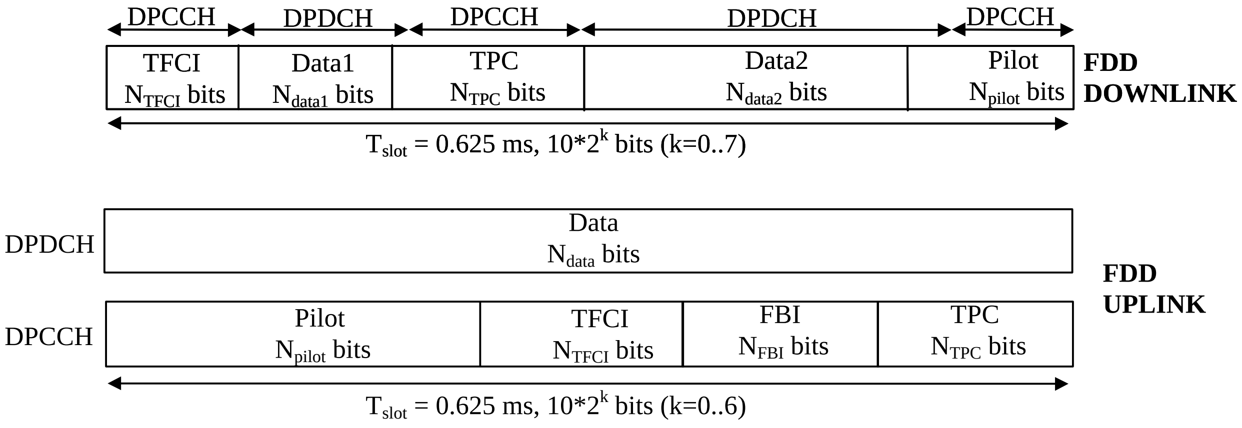

Figure 8. The slot content for the DPDCH/DPCCH. The exact bit allocations are not shown.

For the uplink, the maximum channel bit rate is 1024 kbps using a spreading factor of 4. To obtain higher bit rates for a user several physical channels can be used. The channel bit rate of the DPCCH is fixed to 16 kbps. For the downlink the maximum channel bit rate is 2048 kbps with a spreading factor of 4. Note that the symbol bit rate is equal to the channel bit rate for the uplink while it is half of the channel bit rate for the downlink. This gives a maximum spreading factor of 512 for the downlink and 256 for the uplink.

To be able to support inter-frequency handover as well as measurements on other carrier frequencies or carriers of other systems, like GSM, a compressed mode of operation is defined. The function is implemented by having some slots empty, but without deleting any user data. Instead the user data is transmitted in the remaining slots. The number of slots that is not used can be variable with a minimum of three slots (giving minimum idle lengths of at least 1.63 milliseconds). The slots can be emptied either in the middle of a frame or at the end and in the beginning of the consecutive frame. If and how often is controlled by the RRC functionality in Layer 3.

5.x.2.3.4 Physical frame structure – TDD

The basic physical frame rate is 10 milliseconds with 15 slots. Figure 9 shows the frame structure.

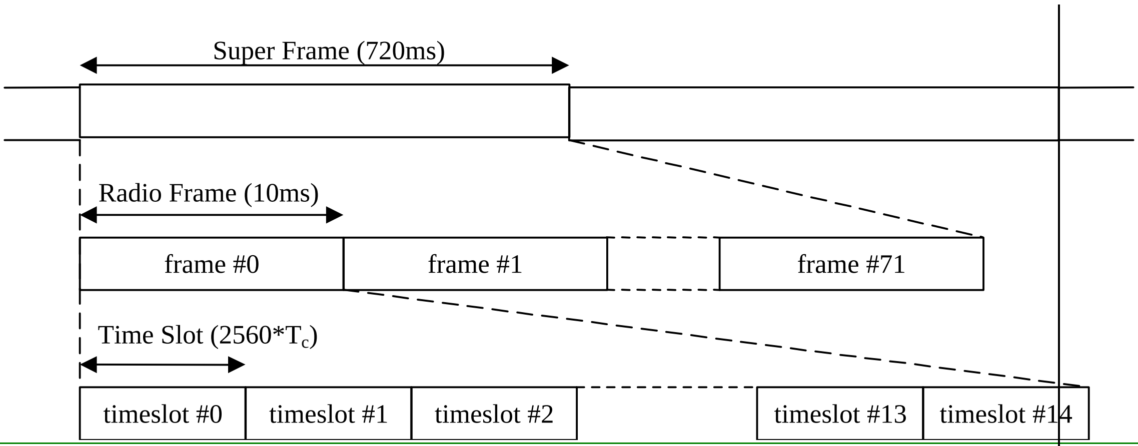

Figure 9: Basic frame structure - TDD

Figure 10 and Figure 11 show the two burst formats stating the content for a slot used by a DCH. The usage of either burst format 1 or 2 is depending on the application for UL or DL and the number of allocated users per timeslot.

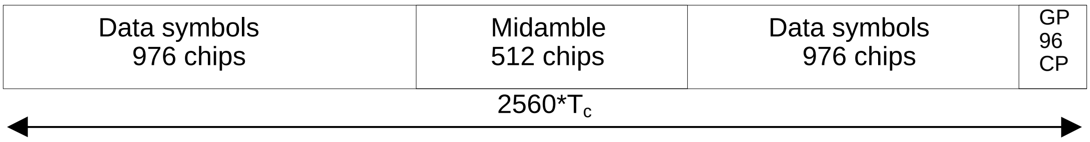

Figure 10 Burst structure of the burst type 1. GP denotes the guard period and CP the chip periods.

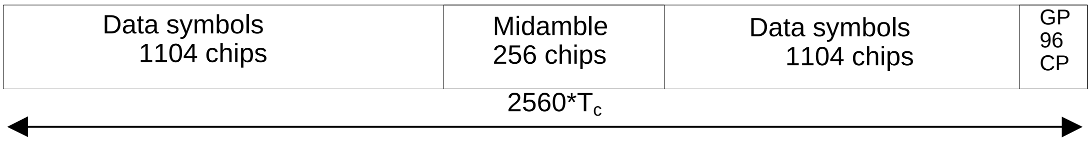

Figure 11 Burst structure of the burst type 2. GP denotes the guard period and CP the chip periods.

In both cases data bits are QPSK modulated and the resulting symbols are spread with a channelisation code of length 1 to 16. Due to this variable spreading factor, each data part of one burst provides the number of symbols as shown in Table 2 below.

Table 2 Number of data symbols in TDD bursts.

Spreading factor (Q)	**Number of symbols (N) per data field in Burst 1**	**Number of symbols (N) per data field in Burst 2**
1	976	1104
2	488	552
4	244	276
8	122	138
16	61	69

Thus, the number of bits per TDD burst is four times the number shown in Table 2.Usage of multicode and multiple timeslots can be applied.

5.x.2.3.45 Spreading, modulation and pulse shaping

Uplink - FDD

Spreading is applied after modulation and before pulse shaping. It consists of two operations. The first is the channelisation operation, which transforms every data symbol into a number of chips, thus increasing the bandwidth of the signal. The number of chips per data symbol is called the Spreading Factor (SF). The second operation is the scrambling operation, where a scrambling code is applied to the spread signal.

In the channelisation operation, data symbol on so-called I- and Q-branches are independently multiplied with a code. The channelisation codes are Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between a user's different physical channels. With the scrambling operation, the resultant signals on the I- and Q-branches are further multiplied by complex-valued scrambling code, where I and Q denote real and imaginary parts, respectively. Note that before complex multiplication binary values 0 and 1 are mapped to +1 and -1, respectively.

Figure 12 illustrates the spreading and modulation for the case of multiple uplink DPDCHs when total data rate is less than or equal to 1024kbps in the 5MHz band (the 2048 kbps case is not shown here). Note that this figure only shows the principle, and does not necessarily describe an actual implementation. Modulation is dual-channel QPSK (i.e.; separate BPSK on I- and Q-channel), where the uplink DPDCH and DPCCH are mapped to the I and Q branch respectively. The I and Q branches are then spread to the chip rate with two different channelisation codes and subsequently complex scrambled by a UE specific complex scrambling code C_{scramb}. There are 2^{24} uplink-scrambling codes based on Gold codes. Either short (X chips equal to one slot length) or long (Y chips equal to one frame length) scrambling codes should be used on the uplink. The short scrambling code is typically used in cells where the base station is equipped with an advanced receiver, such as a multi-user detector or interference canceller whereas the long codes gives better interference averaging properties.

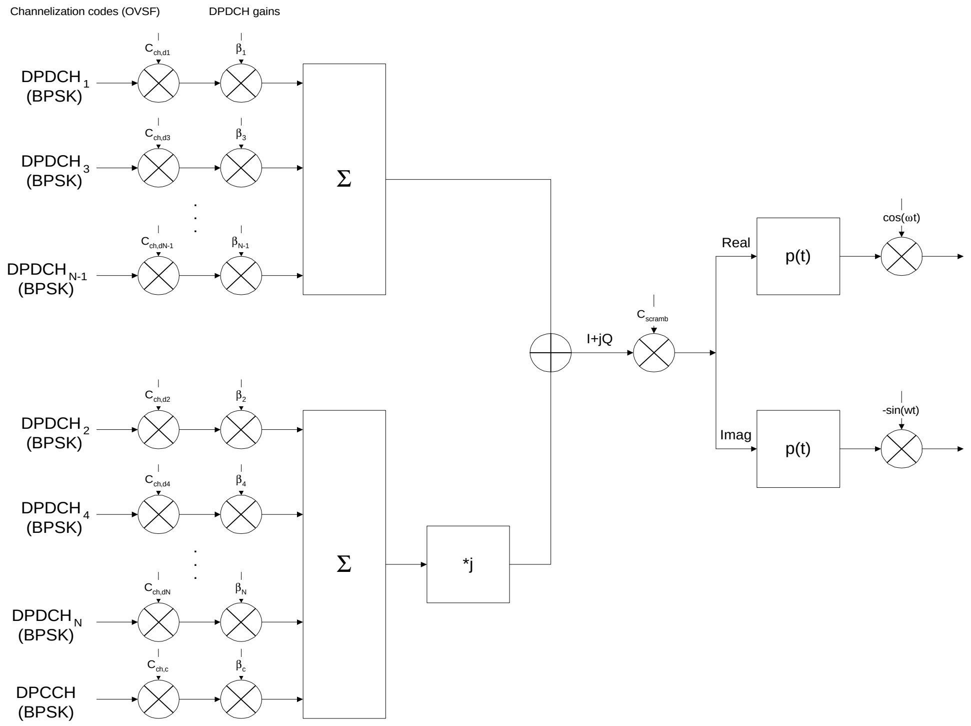

Figure 12. Spreading/modulation for uplink DPDCH/DPCCH for user services less than or equal to 1024kbps in the 5MHz band

The pulse-shaping filters are root-raised cosine (RRC) with roll-off α=0.22 in the frequency domain.

The modulation of both DPCCH and DPDCH is BPSK. The modulated DPCCH is mapped to the Q-branch, while the first DPDCH is mapped to the I-branch. Subsequently added DPDCHs are mapped alternatively to the I or Q-branches.

Downlink - FDD

Figure 13 illustrates the spreading and modulation for the downlink DPCH. Data modulation is QPSK where each pair of two bits are serial-to-parallel (S/P) converted and mapped to the I and Q branch respectively. The I and Q branch are then spread to the chip rate with the same channelisation code c_{ch} (real spreading) and subsequently scrambled by the scrambling code C_{scramb} (complex scrambling).

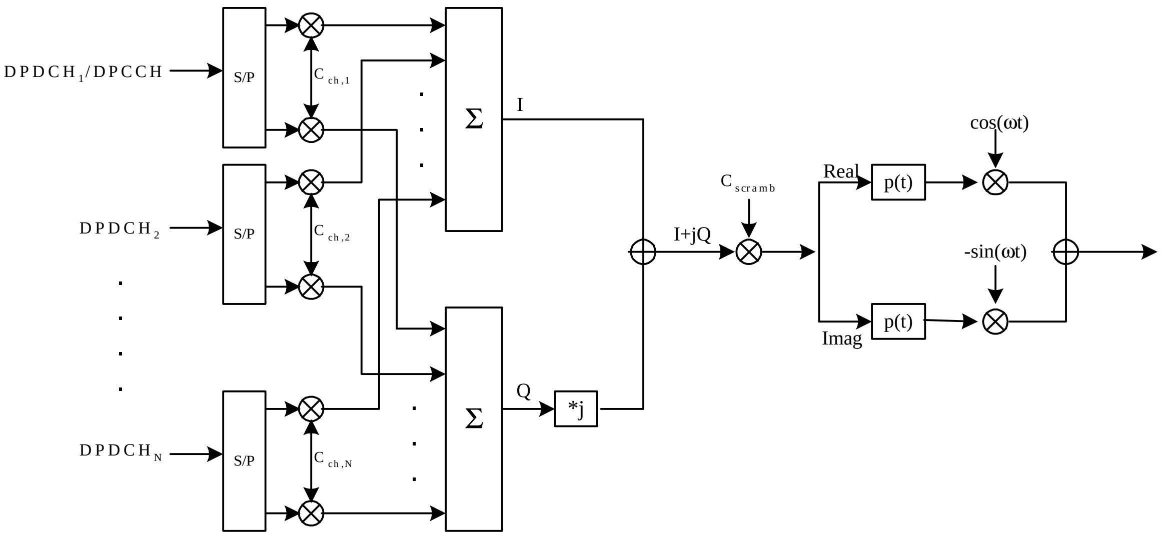

Figure 13. Spreading/modulation for downlink DPCH.

The channelisation codes are the same codes as used in the uplink that preserve the orthogonality between downlink channels of different rates and spreading factors. There are a total 512*512 = 262,144 scrambling codes, numbered 0…262,143. The scrambling codes are divided into 512 sets each of a primary scrambling code and 511 secondary scrambling codes. Each cell is allocated one and only one primary scrambling code. The primary CCPCH is 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 pulse-shaping filters are root raised cosine (RRC) with roll-off α=0.22 in the frequency domain.

Up- and Downlink – TDD

Spreading is applied after modulation and before pulse shaping. It consists of two operations. The first is the channelisation operation, which transforms every data symbol into a number of chips, thus increasing the bandwidth of the signal. The number of chips per data symbol is called the Spreading Factor (SF) and is in the range of 1 to 16. The second operation is the scrambling operation, where a scrambling code is applied to the spread signal. This procedure is similar to FDD Mode, but it should be noted that the midamble part in TDD bursts (see Figure 10 and Figure 11) is not spread.

The applied channelisation codes are OVSF-codes (Orthogonal Variable Spreading Factor-codes) that preserve the distinguishability of different users. The applied scrambling code is cell-specific and 128 different scrambling codes are available.

In the Uplink, the applied midamble is user specific and derived from a cell-specific Basic Midamble Sequence. In the Downlink, the applied midamble is either user specific or common for the whole cell. In each case 128 different Basic Midamble sequences are available.

After spreading same pulse-shaping is applied as in FDD Mode, i.e. the filters are root-raised cosine (RRC) with roll-off α=0.22 in the frequency domain.

5.x.2.4 Layer 2

5.x.2.4.1 Medium Access Control (MAC) layer

The MAC sublayer is responsible for the handling of the data streams coming from the RLC and RRC sublayers. It provides an unacknowledged transfer mode service to the upper layers. It also reallocates radio resources on request by the RRC sublayer as well as provides measurements to the upper layers. Thus, the functionality handles issues like:

- Mapping of the different logical channels to the appropriate transport channels and selection of appropriate transport format for the transport channels based on the instantaneous source bit rate. It also performs the multiplexing /demultiplexing of the PDUs to/from transport blocks which are thereafter further treated by the physical layer.

- performs dynamic switching between common and dedicated transport channels based on information from the RRC sublayer
- handles priority issues for services to one UE according to information from higher layers and physical layer (e.g. available transmit power level) as well as priority handling between UEs by means of dynamic scheduling in order to increase spectrum efficiency
- monitor traffic volume that can be used by the RRC sublayer

5.x.2.4.2 Radio Link Control (RLC) sublayer

The RL C sublayer provides three different types of data transfer modes:

- **Transparent data transfer**. This service transmits higher layer PDUs without adding any protocol information, possibly including segmentation/reassemble functionality.
- **Unacknowledged data transfer**. This service transmits higher layer PDUs without guaranteeing delivery to the peer entity. The unacknowledged data transfer mode has the following characteristics:
    - Detection of erroneous data: The RLC sublayer shall deliver only those SDUs to the receiving higher layer that are free of transmission errors by using the sequence-number check function.
    - Unique delivery: The RLC sublayer shall deliver each SDU only once to the receiving upper layer using duplication detection function.
    - Immediate delivery: The receiving RLC sublayer entity shall deliver a SDU to the higher layer receiving entity as soon as it arrives at the receiver.
- **Acknowledged data transfer**. This service transmits higher layer PDUs and guarantees delivery to the peer entity. In case RLC is unable to deliver the data correctly, the user of RLC at the transmitting side is notified. For this service, both in-sequence and out-of-sequence delivery are supported. In many cases a higher layer protocol can restore the order of its PDUs. As long as the out-of-sequence properties of the lower layer are known and controlled (i.e. the higher layer protocol will not immediately request retransmission of a missing PDU) allowing out-of-sequence delivery can save memory space in the receiving RLC. The acknowledged data transfer mode has the following characteristics:
    - Error-free delivery: Error-free delivery is ensured by means of retransmission. The receiving RLC entity delivers only error-free SDUs to the higher layer.
    - Unique delivery: The RLC sublayer shall deliver each SDU only once to the receiving upper layer using duplication detection function.
    - In-sequence delivery: RLC sublayer shall provide support for in-order delivery of SDUs, i.e., RLC sublayer should deliver SDUs to the receiving higher layer entity in the same order as the transmitting higher layer entity submits them to the RLC sublayer.
    - Out-of-sequence delivery: Alternatively to in-sequence delivery, it shall also be possible to allow that the receiving RLC entity delivers SDUs to higher layer in different order than submitted to RLC sublayer at the transmitting side.

It also provides for RLC connection establishment/release. As well as QoS setting and notification to higher layers in case of unrecoverable errors.

5.x.2.5 Layer 3 (Radio resource control sublayer)

The Radio Resource Control (RRC) sublayer handles the control plane signalling of Layer 3 between the UEs and UTRAN. In addition to the relation with the upper layers (such as core network) the following main functions are performed:

~~**Broadcast of system information to UEs**. Includes both CN and UTRAN specific information.~~

- **Broadcast of information provided by the non-access stratum (Core Network).** The RRC layer performs system information broadcasting from the network to all UEs. The system information is normally repeated on a regular basis. This function supports broadcast of higher layer (above RRC) information. This information may be cell specific or not. As an example RRC may broadcast Core Network location service area information related to some specific cells.
- **Broadcast of information related to the access stratum.** The RRC layer performs system information broadcasting from the network to all Ues This function supports broadcast of typically cell-specific information.

- **Broadcast of ODMA relay node neighbour information.** The RRC layer performs probe information broadcasting to allow ODMA routeing information to be collected.
- **Establishment, maintenance and release of an RRC connection between the UE and UTRAN.** The establishment of an RRC connection is initiated by a request from higher layers at the UE side to establish the first Signalling Connection for the UE. The establishment of an RRC connection includes an optional cell re-selection, an admission control, and a layer 2 signalling link establishment.
- **Collating ODMA neighbour list and gradient information.** The ODMA relay node neighbour lists and their respective gradient information maintained by the RRC.
- **Maintenance of number of ODMA relay node neighbours.** The RRC will adjust the broadcast powers used for probing messages to maintain the desired number of neighbours.
- **Establishment, maintenance and release of a route between ODMA relay nodes.** The establishment of an ODMA route and RRC connection based upon the routeing algorithm.
- **Interworking between the Gateway ODMA relay node and the UTRAN.** The RRC layer will control the interworking communication link between the Gateway ODMA relay node and the UTRAN.
- **Establishment, reconfiguration and release of Radio Access Bearers.** The RRC layer will, on request from higher layers, perform the establishment, reconfiguration and release of radio access bearers in the user plane. A number of radio access bearers can be established to an UE at the same time. At establishment and reconfiguration, the RRC layer performs admission control and selects parameters describing the radio access bearer processing in layer 2 and layer 1, based on information from higher layers.
- **Assignment, reconfiguration and release of radio resources for the RRC connection.** The RRC layer handles the assignment of radio resources (e.g. timeslots, codes) needed for the RRC connection including needs from both the control and user plane. The RRC layer may reconfigure radio resources during an established RRC connection. This function includes co-ordination of the radio resource allocation between multiple radio bearers related to the same RRC connection. RRC controls the radio resources in the uplink and downlink such that UE and UTRAN can communicate using unbalanced radio resources (asymmetric uplink and downlink). RRC signals to the UE to indicate resource allocations for purposes of handover to GSM or other radio systems.
- **RRC connection mobility functions.** The RRC layer performs evaluation, decision and execution related to RRC connection mobility during an established RRC connection, such as handover, preparation of handover to GSM or other systems, cell re-selection and cell/paging area update procedures, based on e.g. measurements done by the UE.
- **Paging/notification.** The RRC layer can broadcast paging information from the network to selected UEs. The RRC layer can also initiate paging during an established RRC connection.
- **Routing of higher layer PDUs.** This function performs at the UE side routing of higher layer PDUs to the correct higher layer entity, at the UTRAN side to the correct RANAP entity.
- **Control of requested QoS**. This function ensures that the QoS requested for the radio access bearers can be met. This includes the allocation of a sufficient number of radio resources~~ (e.g. power levels)~~.
- **UE measurement reporting and control of the reporting.** The measurements performed by the UE are controlled by the RRC layer, in terms of what to measure, when to measure and how to report, including both UMTS air interface and other systems. The RRC layer also performs the reporting of the measurements from the UE to the network.
- **Outer loop power control.** The RRC layer controls setting of the target of the closed loop power control.
- **Contention resolution**. The RRC handles reallocations and releases of radio resources in case of collisions indicated by lower layers.
- **Control of ciphering.** The RRC layer provides procedures for setting of ciphering (on/off) between the UE and UTRAN.
- **Slow DCA**. Allocation of preferred radio resources based on long-term decision criteria.
- **Initial cell selection and re-selection in idle mode.** Selection of the most suitable cell based on idle mode measurements and cell selection criteria.

- **Arbitration of the radio resource allocation between the cells**. This function shall ensure optimal performance of the overall UTRAN capacity.

ATTACHMENT 2

The Summary of Major Technical Parameters Table

<Editor’s note: The following parameters are initial proposals>

Parameter	“Value”	Reference to SDOs/3GPPs Specifications
Multiple access technique and duplexing scheme	Multiple Access: TDMA/CDMA Duplexing: TDD	TSG RAN WG1: TS 25.201
Chip rate	3.84 Mcps	TSG RAN WG4: TS 25.102
Frame length and structure	Frame length: 10 ms 15 slots per frame, each 666.666 µs	TSG RAN WG1: TS 25.221
3 dB Bandwidth Occupied bandwidth	Not specified Less than 5 MHz	TSG RAN WG4: TS 25.102 TSG RAN WG4: TS 25.105
Adjacent Channel Leakage power ratio (transmitter side)	UE: ACLR (5 MHz) = 32 dB ACLR (10 MHz) = 42 dB BS: ACLR (5 MHz) = 45 dB ACLR (10 MHz) = 55 dB	TSG RAN WG4: TS 25.102 TSG RAN WG4: TS 25.105
Adjacent channel selectivity (receiver side)	UE: ACS = 35 dB BS: ACS = 45 dB	TSG RAN WG4: TS 25.102 TSG RAN WG4: TS 25.105
Random access mechanism	RACH burst on dedicated Uplink slot(s)	TSG RAN WG1: TS 25.221 TSG RAN WG1: TS 25.224
Pilot structure	Not applicable, Midambles are used for channel estimation	-
Inter base station asynchronous/synchronous operation	Synchronous operation	TSG RAN WG1: TS 25.224 TSG RAN WG4: TS 25.105

ATTACHMENT 3

The “Overview of the Radio Interface” Section

The information in this part provides the major technical specifications and should be organised from the bottom up, that is Layer 1 (Physical layer), Layer 2, and Layer 3, with respect to the OSI Reference Model. The information should be only technical, clear and complete, and while mainly focused on the radio-dependent aspects should also include sufficient information on the radio independent aspects to provide a complete technology view. It is suggested that the information be covered in about 5 to 10 pages.

The Summary of Major Technical Parameters Table
The purpose of this table is to provide a clear and concise understanding of the radio interface specifications, shown in a summary format.

Parameter	“Value”	Reference to SDOs/3GPPs Specifications

Note: The number of parameters chosen for this table should be sufficient to summarize the radio interface. The parameter selected must be from the actual radio interface specification and in addition to providing a “value” for the parameter, the appropriate reference to the specification (section, number, version, etc.) must be shown in the table. These specifications must be referenced in Section 5.X.3 also. SDOs and 3GPPs can use key characteristics listed in Draft New Recommendation ITU-R M.[IMT.RKEY] for guidance on the type of parameters that might be appropriately included in the table.

If there are any differences with the terminology defined in Recommendation ITU-R M.1224, it should be noted and it should be referenced in Section 5.X.3.

Guidelines for the Inclusion of “Reference from External Material” in RSPC

For the “Reference from External Material” portion of Sections 5.X, using material included by referencing, it has been decided within TG 8/1 that ITU-R TG 8/1 should adopt the structure of the detailed specifications coming from external Standards Development Organizations (SDOs) and 3rd Generation Partnership Projects (3GPPs) and should not attempt to unilaterally edit this material. However, in order to ensure uniformity and understanding of what is included in the references some basic guidelines for this information are presented below:

The “Detailed Specification of the Radio Interface” Section

This part consists of a list of reference documents. If necessary, describe the relationship between references and /or numbering scheme.

The following information should be included for each reference

- Title of the document
- Document number
- Version
- Issued date
- Status
- Location (either physical document or electronic link)
- Brief introduction, less than 5 lines
- Any IPR issue related to this document

Example

25.211 Physical channels and mapping of transport channels onto physical channels (FDD)

Version: xxx.xx; Issued: yyyy-mm-dd; Status: approved by XXX;

Location: http://www.3gpp.org/xxxxxxxxxxx

Synopsis:

This specification describes the characteristics of the Layer 1 transport channels and physicals channels in the FDD mode of UTRA. The main objectives of the document are to be a part of the full description of the UTRA Layer 1, and to serve as a basis for the drafting of the actual technical specification (TS).