TSGR#10(00)0673

TSG RAN meeting #10
6 – 8 December 2000
Bangkok, Thailand

Agenda Item:	5.5
Source:	ITU Ad Hoc
Title:	Submission of future updates of WCDMA to ITU-R WP 8F
Document for:	Approval

Introduction

At its recent meeting in Geneva, 23-27 October 2000, ITU-R WP8F was unable to reach agreement on the planned Revision 1 of Recommendation ITU-R M.1457 in respect of the terrestrial radio interfaces.

A draft document "Update Procedure for Revisions of Recommendation M.1457 (RSPC)" was produced and agreed. This document was issued by the ITU via a Circular Letter for comment and it is available in RP-000675.

ITU's Proposed Update Procedure for Revisions of Recommendation M.1457

Of key interest to 3GPP TSG RAN is Section 4 of this procedure document "Proposed changes to Sections 5.x.1 and 5.x.2 of Recommendation ITU-R M.1457"

> *"In the case that a proposed update is a revision or an addition of SDO standards in Section 5.x.2 which require a modification of the overview part (Section 5.x.1) and/or to the global core specification, the following must be submitted to WP 8F:*
>
> *1) the update of Section 5.x.2,*
>
> *2) the proposed modification to Section 5.x.1, if applicable,*
>
> *3) the modifications to the global core specification, if applicable,*
>
> *4) a summary of the proposed update,*
>
> *5) a self-evaluation of the proposed update against the evaluation criteria, and*
>
> *6) a self-declaration that the proposed amendments are self-consistent between Section 5.x.1, Section 5.x.2 and the GCS.*
>
> *This information may be submitted to WP 8F at any time and over more than one meeting; however, WP 8F will be unable to make a decision until all the required information is available.*
>
> *The transposition process used during the development of the first version of Recommendation ITU-R M.1457 applies."*

Also of interest is Section 6, "Meeting Cycle" which proposes a notional 3-meeting cycle for consideration of proposed revsions to Recommendation ITU-R M.1457.

"The following meeting cycle (of WP 8F) will be used for the consideration of proposed new capabilities. The cycle applies for each proposal received. Suppose a proposal is received at meeting "x", then the following would occur:

***Meeting "x"** - The proposal is presented and discussed with a view to understand what is being proposed. Those proposals which are of such nature that WP 8F agrees that they meet the criteria and can be agreed immediately are adopted at this meeting and those that require further evaluation are carried forward for consideration at the next meeting together with contributions from external evaluation groups as required. WP 8F will notify the proponent of the proposal, and other organizations as required, of issues that require further clarification or additional material that may be required to resolve outstanding issues, in the context of the evaluation criteria (see Sections 7 and 8) and other considerations (see Section 9).*

***Meeting "x+1"** - The proposal is further discussed and evaluated; including the involvement of external evaluation groups as required. Those proposals for which WP 8F agrees that they meet the criteria can be adopted at this meeting and those which WP 8F considers require further evaluation are carried forward to the next meeting. WP 8F will notify the proponent of the proposal, and other organizations as required, of issues that require further clarification or additional material that may be required to resolve outstanding issues, in the context of the evaluation criteria (see Sections 7 and 8) and other considerations (see Section 9).*

***Meeting "x+2"** - The evaluation is completed for the proposed update to Recommendation ITU-R M.1457, except for exceptional circumstances. If the proposal is for a new radio interface, additional consideration at subsequent meetings will likely be necessary for completing this evaluation. Those proposals for which WP 8F agrees that they meet the criteria are adopted at this meeting for the next revision of Recommendation ITU-R M.1457."*

3GPP TSG RAN response to ITU-R on the detailed contents of this procedure document is proposed in TSGR#10(00)0674. However under the proposals contained in this procedure document it is clear that in order for the update work in 3GPP TSG RAN to be included in the next revision of Recommendation ITU-R M.1457, planned for October 2001, 3GPP TSG RAN must submit preliminary technical information on work items of significance to the fourth meeting of WP8F in February 2001.

Proposal

3GPP TSG RAN is therefore invited to review and adopt the attached Liaison Statement to ITU-R WP8F (attached at Annexes 1, 2, 3, and 4), which submits high level descriptions of some significant 3GPP TSG RAN work items to ITU-R WP8F for consideration as an enhancement to the WCDMA (DS-CDMA) radio interface.

ANNEX 1

DRAFT LIAISON STATEMENT TO ITU-R WP8F #4, FEBRUARY 2001

Subject: Question ITU-R 229/8 (Recommendation ITU-R M.1457 - RSPC)

[ITU Member][1]

FUTURE UPDATES OF WCDMA (DS-CDMA)

3GPP TSG RAN notes with interest the recent work within ITU-R WP8F on the update procedure for revisions of Recommendation ITU-R M.1457.

In a previous response to ITU-R WP 8F's Liaison Statement on the updating of Recommendation ITU-R M.1457, 3GPP TSG RAN drew particular attention to some of its work items , that proposes enhancements to WCDMA. This work is now at a stage where it is considered appropriate to propose it for incorporation in Recommendation ITU-R M.1457, as an enhancement to the WCDMA (DS-CDMA) radio interface.

Annexes 1-5 contain high level descriptions of some significant 3GPP TSG RAN work items 3GPP TSG RAN believes there is no need for any further technical evaluation against the "Requirements and Objectives of IMT-2000" and the "Minimum Performance Capabilities for IMT-2000" since the proposed material constitutes enhancements to the IMT-2000 CDMA DS and IMT-2000 CDMA TDD that already proved their compliance with the above mentioned requirements. For further comments on the procedure proposed by ITU-R WP 8F for the Revision of Recommendation ITU-R M.1457, please refer to Doc 8F/XXX-E.

For completeness, Annex 6 contains the dates of the future meetings of TSG RAN that may be considered by ITU-R WP 8F when further developing its workplan, including revision or enhancement of Recommendation ITU-R M.1457.

[Editor's note: if needed, also the updated version of the table currently contained in the Annex of Circular Letter 8/LCCE/85 (RP-000675) with provisional target date for completion of some relevant Work Items should be added as Annex 7.]

3GPP TSG RAN would like to continue its fruitful liaison with ITU-R WP 8F on the future development of IMT-2000 and in particular Recommendation ITU-R M.1457.

Proposal

It is proposed that High Speed Downlink Packet Access should be considered by ITU-R WP8F for incorporation in Recommendation ITU-R M.1457, as an enhancement to the WCDMA (DS-CDMA) radio interface

Annexes: 6

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[1] This contribution was developed in 3GPP TSG RAN.

ANNEX 1

3GPP TSG RAN Work Item – Terminal Power saving features

Gated DPCCH transmission scheme ("Gating”) is basically reduced power control rate operation to get power saving and interference reduction by turning off transmission intermittently. Gating can be applied during DSCH (downlink shared channel transmission) and implies that the UL and DL DPCCH are only transmitted intermittently. UTRAN initiate and terminate the gating by higher layer signalling. During gating, limited amount of data can be transmitted without terminating gating.

With the gated DPCCH transmission scheme, UE battery life can be extended by turning off the transmitter intermittently, and also , if desired, by utilising the possibility to turn off the receiver , if 'RX gating DRX cycle' is defined to be greater than one. Furthermore, by means of gated transmission, uplink and downlink interference may be reduced leading to improved uplink and downlink capacity.

ANNEX 2

3GPP TSG RAN Work Item - High Speed Downlink Packet Access

The goal of High-Speed Downlink Packet Access (HSDPA) is to enhance the UTRA support for downlink packet asccess. More specifically, the goals are:
- Significantly higher peak data rates for downlink packet data
- Significantly higher overall throughput for downlink packet data
- Reduced delay for downlink packet data

HSDPA it to be based on a High-Speed Downlink Shared Channel (HS-DSCH), a downlinkchannel shared by multiple users in the time and possibly aslo in the code domain. The following new features are considered for HSDPA:
- Adaptive Modulation and Coding (AMC)
- Fast Hybrid ARQ (F-HARQ)
- Fast Cell Selection (FCS)
- Multiple-input/multiple-output (MIMO) antenna processing

These features are brirefly described below. To support these features, some functionality, currently residing in the the RNC, is proposed to be moved to the Node B for HSDPA. This includes:
- Scheduling for HSDPA
- Transport-format selection for HSDPA (AMC)
- ARQ termination for HSDPA (fast Hybrid ARQ)

Adaptive Modulation and Coding

The principle of AMC is to change the modulation and coding format in accordance with variations in the channel conditions, subject to system restrictions. The channel conditions can be estimated e.g. based on feedback from the receiver. Thus, AMC is used instead of fast power control to compensate for variations in the channel conditions. In a system with AMC, users close to the base station are typically assigned higher order modulation with higher code rates (e.g. 64 QAM with R=3/4 Turbo Codes), but the modulation-order and/or code rate will decrease as the distance from base station increases.

Fast Hybrid ARQ

Fast H-ARQ is an implicit link adaptation technique where incorrectly decoded data is not discarded but is combined with some incremental redundancy information provided by the transmitter by means of retransmissions for subsequent decoding. Fast Hybrid ARQ relaxes the requirements on the AMC and makes the AMS less sensitive to errors in the channel-quality estimates. Different aproaches to fast HARQ are considered for HSDPA, such as:
- Chase combining vs Incremental Redundancy
- N-channel Stop-&Wait vs. Asynchronous and Adaptive Redundancy

Fast Cell Selection

With Fast Cell Selection, the UE does not receive simultaneous data transmission from multiple cells and therefore performs no combining of traffic channels carrying packet data. Instead, the UE selects the best cell every frame from which it requests the data to be transmitted. The uplink DPCH is used to indicate the required cell from which the network should direct its data

transmission to the UE on a frame by frame basis. This technique is thus similar to Site Selection Diversity (SSDT) as currently supported by UTRA but applies only to the HS-DSCH.

Multiple-input/multiple-output Antenna Processing

Multiple input multiple output (MIMO) processing employs multiple antennas at both the base station transmitter and terminal receiver, providing several advantages over transmit diversity techniques with multiple antennas only at the transmitter and over conventional single antenna systems. First, using multiple receive antennas, the gain from antenna combining reduces the required power for achieving a given rate. Alternatively, one can achieve higher rates using the same power, resulting in a higher overall cell throughput. Second, if multiple antennas are available at both the transmitter and receiver, the peak throughput can be increased using a technique known as code re-use whereby each spreading code on the DSCH is used to modulate up to *M* distinct data streams, where *M* is the number of transmit antennas. Data streams which share the same spreading code must be distinguished based on their spatial characteristics, requiring a receiver with at least *M* antennas. In principle, the peak throughput with code re-use is *M* times the rate achievable with a single transmit antenna. Higher peak throughputs imply not only better average throughputs but also better throughput-delay characteristics. Third, with code re-use, some intermediate data rates can be achieved with a combination of code re-use and smaller data constellations. Compared to the single antenna transmission scheme with a larger constellation to achieve the same rate, the code re-use technique can have a smaller required Eb/No, resulting in overall improved system performance.

ANNEX 3

3GPP TSG RAN Work Item – Node B Synchronisation for TDD

Cell synchronisation is planned for UTRA TDD in order to fully exploit the system capacity. There are several factors, that have an impact on the system capacity. The most important ones are:

- Inter-slot interference: without frame synchronisation there could be leakage from an UL timeslot into a DL timeslot, especially crucial for the UE due to the potentially close distance between UEs and the near-far effect.
- Neighbouring cell monitoring: In TDD mode, certain measurements have to be performed in certain parts of certain timeslots of neighbouring cells. Without cell synchronisation, the UE would have to synchronise itself before being able to perform the measurements.
- Handover: The TDD mode may use timing advance in order to align receptions from all UEs at the cell's receiver. After a handover, the UE has to start transmission in the new cell with a timing advance value as good as possible. With the assumption, that the TDD cells are synchronised to each other, the handover performance can be optimised.

The synchronisation procedure considered for UTRA TDD is based on using transmissions of cell synchronisation bursts in predetermined PRACH time slots based on an RNC schedule. Such soundings between neighbouring cells facilitate timing offset measurements by the cells. The timing offset measurements are reported back to the RNC for processing. The RNC generates cell timing updates that are transmitted to the Node Bs and cells for implementation. CEC sequences with multiple offsets are used as cell synchronisation bursts.

ANNEX 4

3GPP TSG RAN Work Item – Radio Bearer support enhancements

Under the work item Radio Access Bearer Enhancements, the work on header compression for IP packets suitable for a wireless environment have been done in 3GPP and IETF during year 2000.

The former header compression schemes that are standardised in the IETF were not designed for cellular usage and especially the schemes that compress real-time IP headers do not cope well over unreliable links such as the cellular environment. Also, wireless links exhibit long round trip times (RTT) and therefore loss of synchronisation of contexts between the compressor and decompressor can result in a large loss of packets until synchronisation is achieved. As IP based multimedia services are increasing rapidly, a need has arisen to support real-time IP services in UTRAN. However, with the added difficulties due the radio interface as described earlier there is a need for header compression to be robust in the cellular environment.

It has been the task of the IETF WG called “Robust Header Compression” or ROHC to standardise a header compression protocol that is suitable for wireless links. A robust scheme should tolerate errors on the link over which header compression takes place (including both frame losses and residual bit errors) without losing additional packets, introducing additional errors or using more bandwidth.

The ROHC protocol is currently the only protocol that is being standardised by the ROHC WG. ROHC framework handles several compression profiles. Currently it contains profiles that are able to compress RTP/UDP/IP, UDP/IP and ESP/IP streams for both IPv4 and IPv6.

It has been the task of 3GPP to include the ROHC protocol into the framework of WCDMA and UTRA TDD during year 2000.

ANNEX 5

3GPP TSG RAN Work Item – UE Positioning Enhancements, usage of Idle Periods in Downlink (IPDL) for TDD

Under the work item UE Positioning Enhancements the necessary enhancements in TDD to support OTDOA (Observed Time Difference of Arrival) IPDL methods will be introduced during the year 2000. The UE can make the necessary measurements in every slot within a frame. Because of having synchronised cells, a relative time difference between neighbouring cells is not needed for the position estimation.

Because of traffic in the serving cell as well as in neighbouring cells and multipath propagation, the UE might be unable to detect an sufficient number neighbouring cells. This is known as the hearability problem. Therefore, probably only UEs that are located on the edge of a cell are able to determine their location by using the OTDOA method.

To overcome the hearability problem, an idle period method may be used. In this method each base station ceases its transmission for short periods of time (idle periods). During an idle period of a base station, terminals within the cell can measure other base stations and the hearability problem is reduced. The idle periods in TDD are realised by ceasing the transmission within a whole slot. The timing of the idle period occurences is signalled to the UE via RRC signalling, so that the UEs know when to expect the idle period.

ANNEX 6

3GPP TSG RAN future meetings dates

Meeting	Date	Location
RAN#11	14 - 16 March 2001	Palm Springs, CA, USA
RAN#12	13 - 15 June 2001	Stockholm, Sweden
RAN#13	19 - 21 September 2001	Beijing, China
RAN#14	12 - 14 December 2001	Tokyo, Japan

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