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Title: **TR 25.888 of inter-RAT measurement improvement for LCR TDD**
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Since previous TSG RAN #16 meeting. Study area of TR25.888 has been identified and related text proposals were approved after TSG RAN1 #28 meeting. This contribution presents TR25.888 v1.0.0 for the information of TSG RAN plenary No.17.

Reference

[1] 3GPP TSGR1-02-1059, Updated TDD inter-RAT measurement TR 25.888, Samsung Electronics, Aug. 2002

3G TR 25.888 V1.0.0 (2002-9)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Improvement of inter-frequency and inter-system Measurement for 1.28Mcps TDD

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Contents

Foreword

This Technical Report(TR) has been produced by the 3rd Generation Partnership Project (3GPP), Technical Specification Group RAN.

The contents of this TR are subject to continuing work within the 3GPP TSG and may change following formal TSG approval. Should the TSG modify the contents of this TR, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

1. Scope

In order to improve monitoring other RAT systems or performing inter-frequency measurements in 1.28 Mcps TDD , the channel re-assigning scheme with signaling support and other possible solutions are proposed and investigated, potentially allowing the UE to have a longer measurement window or to avoid possible measurement failures.The purpose of this document is to help the TSG RAN WG1, WG2, WG3 and WG4 to understand potential benefits with respect to the respective study areas, to investigate the proposed method and to identify the impacts to current specifications, which is needed for the introduction of the improvement of inter-frequency and inter-system measurement for1.28Mcps TDD.

The different study areas will be described in subsequent chapters.

It is intended to gather all information in order to trace the history and the status of the SI in each WGs.

The TR should:

- describe the proposed methods for each study area.

- describe the impacts due to this SI.

- describe agreed requirements related to the SI.

- identify the affected specifications according to the introduction of inter frequency and inter system measurement for 1.28 Mcps TDD and

- also describes the schedule of the SI.

2. References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.
References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

For a specific reference, subsequent revisions do not apply.

For a non-specific reference, the latest version applies.

[1] 3GPP TS 25.123, “Requirements for Support of Radio Resources Management”

[2] 3GPP TS25.222, “Mulplexing and channel coding (TDD)”

[3] 3 GPP TS25.224, “Physical Layer Procedures (TDD)”

[4] 3GPP TS25.423, “UTRAN Iur Interface RNSAP Signalling”

[5] 3GPP TS25.433, “UTRAN Iub Interface NBAP Signalling”

[6] 3GPP TS 25.331, “RRC Protocol Specification”.

3. Definitions, symbols and abbreviations

3.1. **Definitions**

For the purposes of the present document, the following terms and definitions apply.

3.2. Symbols

3.3. Abbreviations

4. Requirements

The general requirements of any proposed schemes are summarised as follows:

- Full backward compatibility with the previous release should be kept.
- The signalling overhead in the higher layers should be minimized.
- The proposed scheme must show a reasonable performance improvement.

5. Study Areas

5.1. Asymmetric pattern for time slot allocation

In current Rel-4 specification, some idle time slots without traffic can be used for inter-frequency or inter-system monitoring in 1.28 Mcps TDD. In the conventional scenarios, traffic channel allocation is symmetric, which means two sub-frames in one frame will use the same time slot allocation pattern. However, it can occur that the measurement window may be very short and result in relatively long synchronisation time or synchronisation failure. Especially in FDD case, only small number of consecutive SSCs can be acquired in one measurement window.

In order to synchronize with FDD when UE handover to FDD from 1.28Mcps TDD, 1.28Mcps TDD UE should monitor Primary SCH in order to get time slot timing, and monitor Secondary SCH of FDD to get frame timing. For Primary SCH, PSC with length of 256 chips is the same for every cell in the system and transmits once every slot. For Secondary SCH, it repeatedly transmits a sequence of 15 SSCs with length of 256 chips every frame. Figure1 give an example of traffic channels allocation in conventional scheme. Whenever we take traffic channel allocation in conventional scheme as described Figure 1, the measurement window may be so short that at most two consecutive SSCs can be acquired in one measurement window. Consequently, it may be possible that we can't get enough timing information for synchronization with FDD, and the probability of successful handover will be decreased greatly. Considering the best case of conventional scheme which means UL and DL are neighboring the second switching point, the measurement window length is 5 idle timeslots, and at most 4 consecutive SSCs can be acquired. During the procedure of measurement, all the possible traffic channel allocation should be

considered.

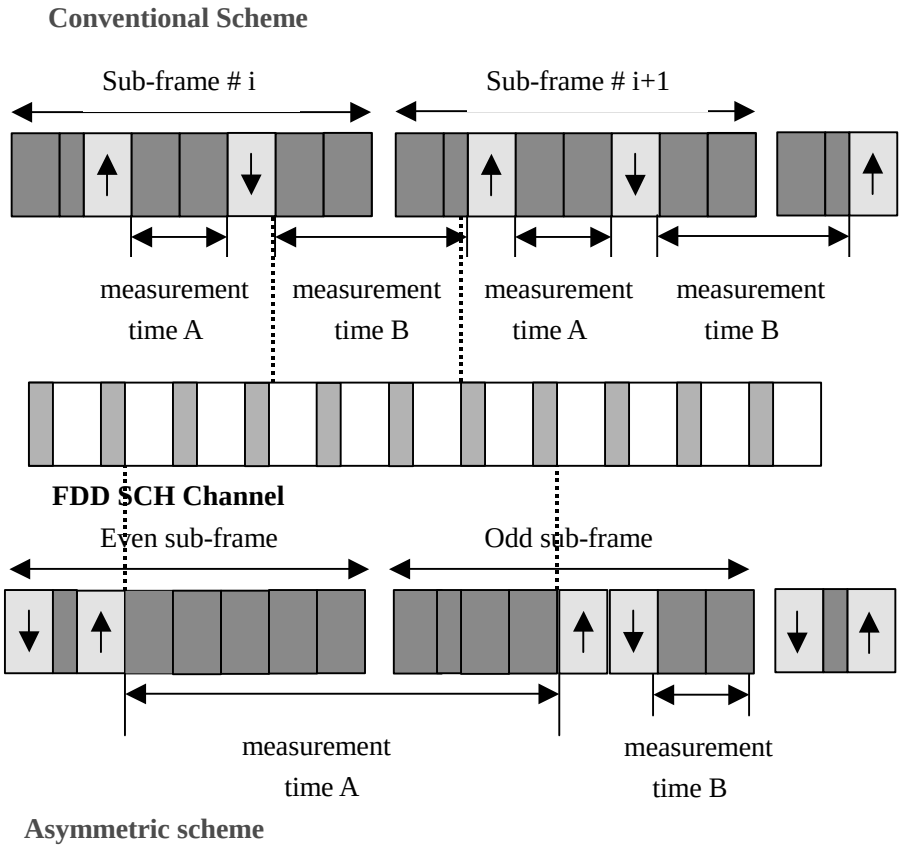

Figure 1. Comparison of the measurement window length between symmetric and asymmetric time slot allocation pattern.

Therefore, in order to solve the addressed problems in conventional scheme, special kind of asymmetric pattern for time slot allocation in each 1.28Mcps TDD frame is proposed to get a longer measurement window. In asymmetric channel allocation pattern, channel allocation is different in two sub-frames of one frame. In one frame, the first sub-frame is called as even sub-frame, and the second sub-frame as odd sub-frame. In even sub-frame, downlink traffic channel is re-assigned to TS0, and uplink traffic channel is re-assigned to TS1; in odd sub-frame, downlink traffic channel is re-assigned to the timeslot just after the second switching point, and the uplink traffic channel to the timeslot just before the second switching time. So measurement can be carried out during all idle time slots except the pre-assigned traffic timeslots.

It can be seen from Figure 1 that asymmetric pattern for time slot allocation provides larger measurement window than conventional scheme. This is partially due to the reduction of number of RF frequency switching, hence the consideration for switching time in this study area is needed.

Considering the impact on other function, further investigations on the impact of power control, beam-forming, uplink synchronization, DCA, and the maximum number of traffic channels in TS0 which is also used for the P-CCPCH resulted from employing the asymmetric time slot allocation pattern are necessary in relation to this study item.

5.2. Combination of different time slot allocation pattern

In order to synchronize with 3.84Mcps TDD before handover to 3.84Mcps TDD from 1.28Mcps TDD, 1.28Mcps TDD UE needs to monitor Primary SCH and Secondary SCH of 3.84Mcps TDD. There are 2 cases of SCH and P-CCPCH allocation in 3.84 Mcps TDD: case 1; SCH and P-CCPCH allocated in TS #k, k=0,1,…,14; case 2; SCH allocated in two timeslots, TS #k and TS#k+8, k=0,1,…,6, and P-CCPCH

allocated in TS #k. SCH consists of parallel of a primary and three secondary code sequences each 256 chips long.

In current Rel-4 specification, some idle time slots without traffic can be used for inter-frequency or inter-system measurement in 1.28 Mcps TDD. When 1.28 TDD UE monitors the 3.84Mcps TDD cell, SCH in 3.84Mcps TDD can't be acquired in current measurement window in 1.28Mcps TDD whenever the traffic channel in 1.28 Mcps TDD is aligned with SCH in the 3.84 Mcps TDD. Refer to Figure 2 and Figure 3 which exist problems during 1.28Mcps TDD UE synchronisation with 3.84Mcps TDD cell in case 1 and case 2 respectively. Even if the traffic channel in 1.28Mcps TDD may change, there is still the probability of not being able to acquire SCH in 3.84 Mcps TDD, this probability depends on the location to which traffic channels change.

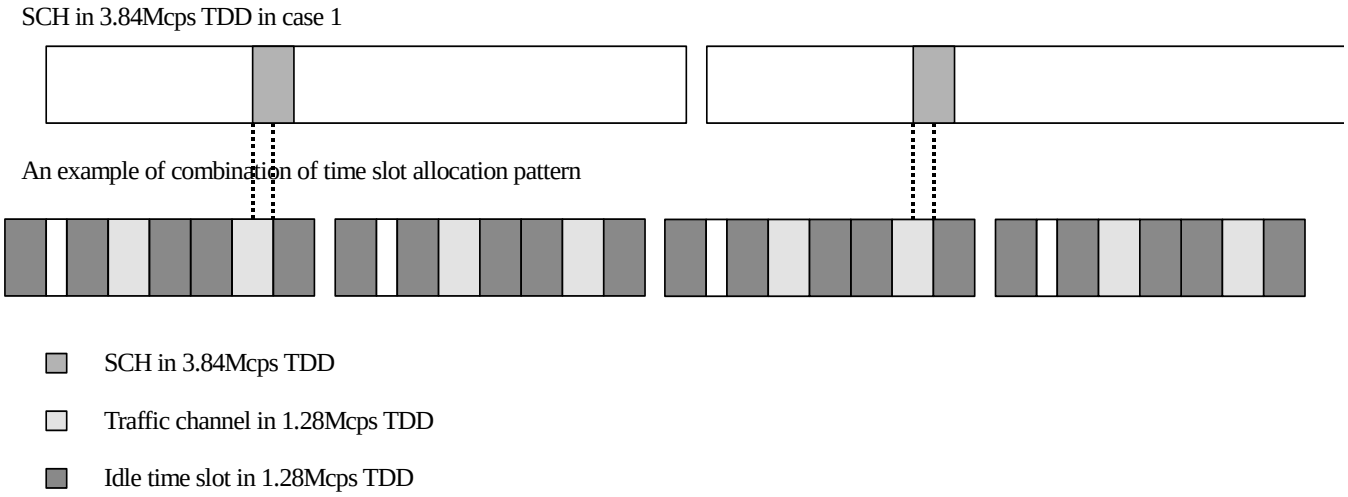

Figure 2. Problem identification in case 1 when 1.28Mcps TDD UE monitoring 3.84Mcps TDD cell

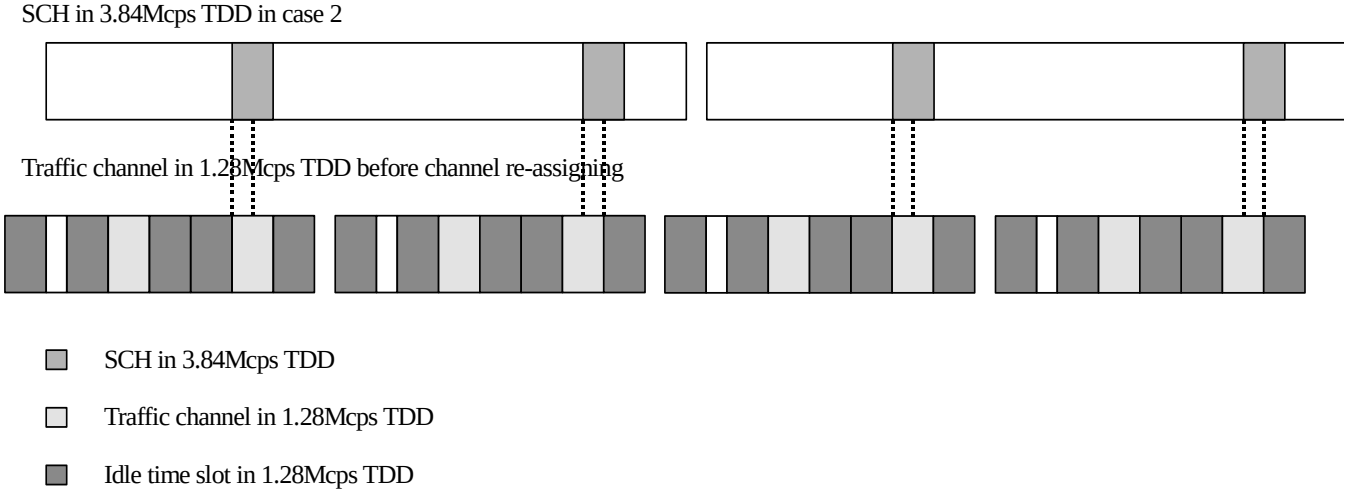

Figure 3. Problem identification in case 2 when 1.28Mcps TDD UE monitoring 3.84Mcps TDD cell

Therefore, in order to solve the addressed problems in conventional scheme, combination of different time slot allocation pattern is proposed to change traffic time slots according to some kind of predefined time slot allocation pattern in order to guarantee the higher or perfect (100%) probability of acquiring SCH in 3.84Mcps TDD.

Combination of different time slot allocation pattern means that traffic channels is re-assigned according to some predefined time slot allocation frame by frame periodically like this:
1st frame: pattern # A

2nd frame: pattern # B
3rd frame: pattern # A
4th frame: pattern #B
This cycle repeats periodically …..
Here pattern #A or pattern #B refers to one kind of traffic time slot allocation in one frame.

Figure 4 is an example of such combination of different time slot allocation pattern. Pattern #A is configured as TS3 for UL, TS4 for DL;
Pattern #B is configured as TS1 for UL, TS6 for DL;
That means:
1st frame: TS3 for UL, TS4 for DL
2nd frame: TS1 for UL, TS6 for DL
3rd frame: TS3 for UL, TS4 for DL
4th frame: TS1 for UL, TS6 for DL
This cycle repeats periodically….
All idle time slots without traffic can be used for measurement.

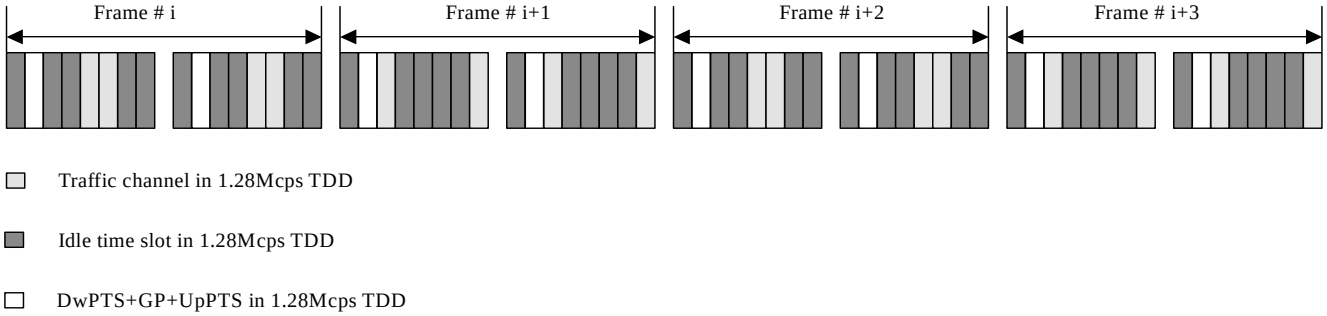

Figure 4 aAn example of combination of different time slot allocation pattern

Figure 5 and figure 6 give an example to illustrate the necessity of using the combination of time slot allocation pattern, and it also provides preventing the measurement failure during synchronization procedure.

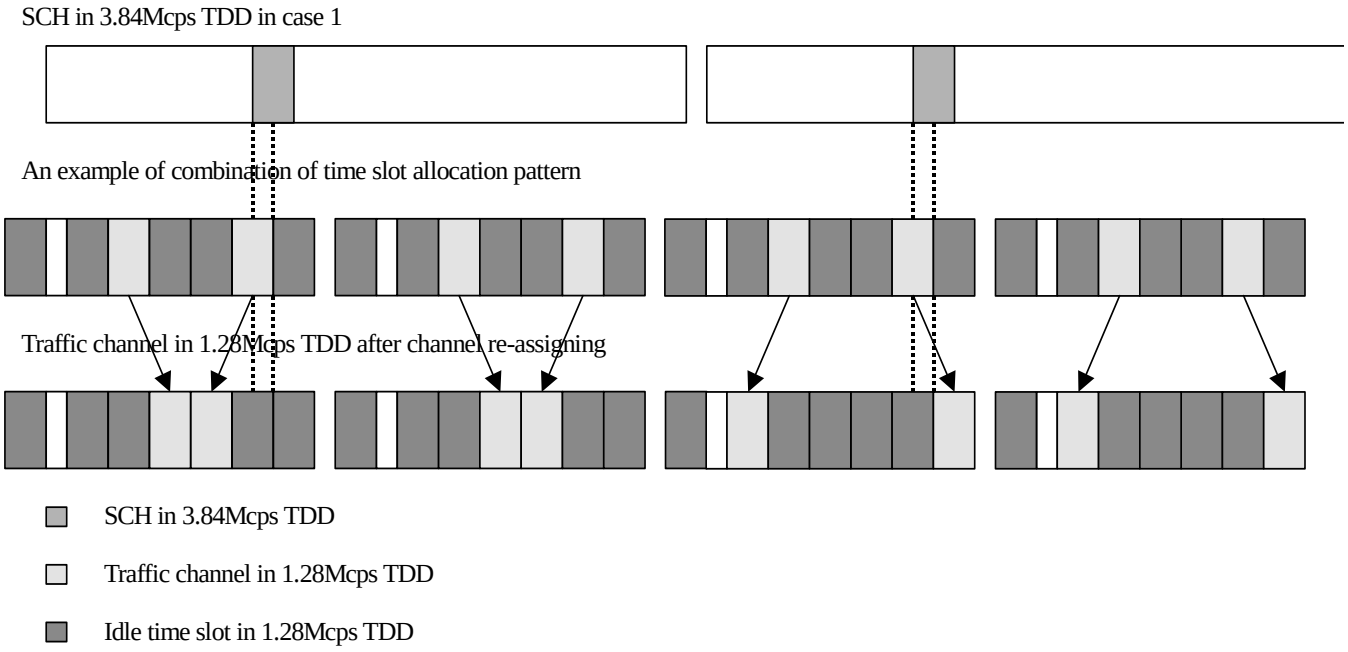

Figure 5. Comparison of monitoring SCH in 3.84Mcps TDD by using combination of time slot

allocation pattern and conventional scheme in case 1

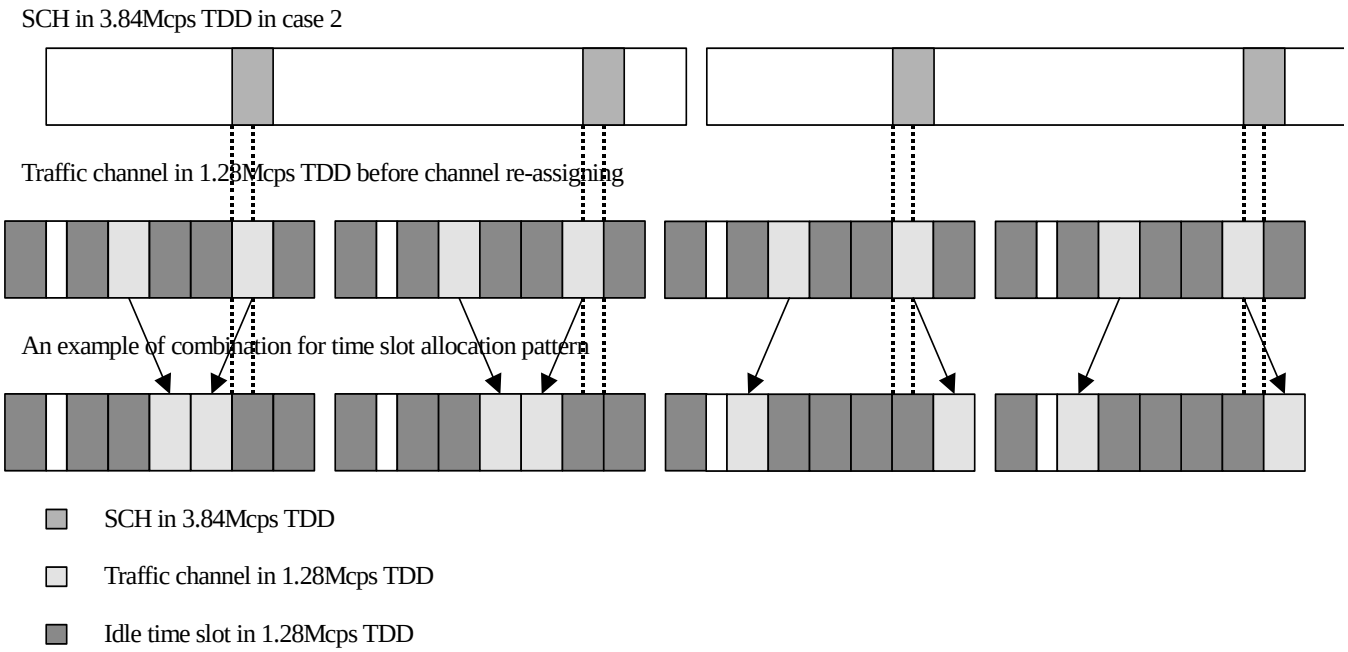

Figure 6. Comparison of monitoring SCH in 3.84Mcps TDD by using combination of time slot allocation pattern and conventional scheme in case 2

In order to resolve the addressed problems, it is necessary to study the combination method of different time slot allocation pattern in which traffic time slots can change according to some kind of predefined time slot allocation pattern in order to guarantee the higher or perfect (100%) probability of acquiring SCH in 3.84Mcps TDD.

Considering the impact on other functions of 1.28 Mcps TDD, further investigation of the impact on the power control, beam-forming, uplink synchronisation and DCA etc. by employing proposed combination method is also necessary in relation to this SI.

6. Proposed methods

6.1. Channel reassigning method

6.1.1 Overview of proposed channel re-assigning method

6.1.2 GSM measurement

6.1.3 FDD measurement

6.1.4 3.84Mcps TDD measurement

6.1.5 1.28Mcps TDD measurement

6.1.6 Impacts on other function

6.2. Other methods

7. Impacts on TSG RAN Specifications

7.1. WG1

7.2. WG2

7.3. WG3

7.4. WG4

8. Agreements and associated contributions

9. Backward Compatibility

10. Project Plan

10.1. Schedule

Date	Meeting	Scope	[expected] Input	[expected]Output
2003.03	RAN#19	TR Submission		V5.0.0

10.2. Work task Status

	Planned Date	Milestone	Status

11. History

Document history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2001.11	RAN 1 #22	R1-01-1317			Draft TR submitted to RAN#14		0.0.1
2002.01	RAN 1#23	R1-02-0121			Correction based on comments from RAN14	0.0.1	0.0.2
2002.02	RAN 1#24	R1-02-0468			Revised draft TR structure and scope	0.0.2	0.0.3
2002.05	RAN1#26	R1-02-0516			TR structure revised and scope updated. Document was approved.	0.0.3	0.1.0
2002.08	RAN1#28	R1-02-1059			mail approval of study area	0.1.0	1.0.0
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