TSG-RAN Meeting #11
Palm Springs, CA, U.S.A., 13-16 March 2001

RP-010072

Title: **Agreed CRs (Release 4) for WI "UE Positioning enhancement"**
Work Item Code : ***LCS1-UEpos-enh***

Source: **TSG-RAN WG1**

Agenda item: **6.5.2**

No.	R1 T-doc	Spec	CR	Rev	Subject	Cat	V_old	V_new
1	R1-01-0411	25.215	085	-	RTD measurement in UTRAN for FDD	B	3.5.0	4.0.0
2	R1-01-0226	25.221	044	-	Correction of beacon characteristics due to IPDLs	C	3.5.0	4.0.0
3	R1-01-0389	25.224	048	1	Idle periods for IPDL location method	B	3.5.0	4.0.0
4	R1-01-0229	25.225	025	-	RTD measurement in UTRAN for UP-TDD	B	3.5.0	4.0.0

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R1-01-0411

CR-Form-v3

CHANGE REQUEST

⌘ **25.215 CR 085** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	CR 25.215-085 on RTD measurement in UTRAN for FDD
Source:	⌘	TSG RAN WG1
Work item code:	⌘	LCS1-UEpos-enh
Date:	⌘	1-Mar-2001
Category:	⌘	**B**
Release:	⌘	REL-4

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F *(essential correction)*
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D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	UTRAN RTD measurement is necessary for the OTDOA positioning method.
Summary of change:	⌘	Introduction of RTD measurement.
Consequences if not approved:	⌘	OTDOA positioning methods do not work properly.

Clauses affected:	⌘	5.2.14		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.331
Other comments:	⌘			

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5.2.14 SFN-SFN observed time difference

Definition	The relative timing difference between cell j and cell i, defined as $T_{CPICHRxj}$ - $T_{CPICHRxi}$, where: $T_{CPICHRxj}$ is the time when the LMU receives one Primary CPICH slot from cell j and $T_{CPICHRxi}$ is the time when the LMU receives the Primary CPICH slot from cell i that is closest in time to the Primary CPICH slot received from cell j.

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R1-01-0226

CR-Form-v3

CHANGE REQUEST

⌘ **25.221** **CR** **044** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	CR 25.221-044 Correction of beacon characteristics due to IPDLs
Source:	⌘	TSG RAN WG1
Work item code:	⌘	LCS1-UEpos-enh
Date:	⌘	23. Feb. 2001
Category:	⌘	**C**
Release:	⌘	REL-4

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2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	A beacon channel may not be transmitted due to idle periods. In this case, the definition of the presence of beacon channels according to the actual specification does not apply.
Summary of change:	⌘	Clarification that in case of IPDLs it may be possible that in the IPDL frames no beacon channel is present.
Consequences if not approved:	⌘	Incorrect definition of beacon channels if a UP method with idle periods is based on beacon channels.

Clauses affected:	⌘	5.5		
Other specs Affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.331
Other comments:	⌘			

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5.5 Beacon characteristics of physical channels

For the purpose of measurements, physical channels at particular locations (time slot, code) shall have particular physical characteristics, called beacon characteristics. Physical channels with beacon characteristics are called beacon channels. The locations of the beacon channels are called beacon locations. The ensemble of beacon channels shall provide the beacon function, i.e. a reference power level at the beacon locations, regularly existing in each radio frame. Thus, beacon channels must be present in each radio frame, the only exception is when idle periods are used to support time difference measurements for location services [9]. Than it may be possible that the beacon channels occur in the same frame and time slot as the idle periods. In this case, the beacon channels will not be transmitted in that particular frame and time slot.

5.5.1 Location of beacon channels

The beacon locations are determined by the SCH and depend on the SCH allocation case, see 5.3.4:

Case 1) The beacon function shall be provided by the physical channels that are allocated to channelisation code $c_{Q=16}^{(k=1)}$ and to TS#k, k=0….14.

Case 2) The beacon function shall be provided by the physical channels that are allocated to channelisation code $c_{Q=16}^{(k=1)}$ and to TS#k and TS#k+8, k=0…6.

Note that by this definition the P-CCPCH always has beacon characteristics.

5.5.2 Physical characteristics of beacon channels

The beacon channels shall have the following physical characteristics. They:

- are transmitted with reference power;
- are transmitted without beamforming;
- use burst type 1;
- use midamble $m^{(1)}$ and $m^{(2)}$ exclusively in this time slot; and
- midambles $m^{(9)}$ and $m^{(10)}$ are always left unused in this time slot, if 16 midambles are allowed in that cell.

Note that in the time slot where the P-CCPCH is transmitted only the midambles $m^{(1)}$ to $m^{(8)}$ shall be used, see 5.6.1. Thus, midambles $m^{(9)}$ and $m^{(10)}$ are always left unused in this time slot.

The reference power corresponds to the sum of the power allocated to both midambles $m^{(1)}$ and $m^{(2)}$. Two possibilities exist:

- If no Block STTD antenna diversity is applied to P-CCPCH, all the reference power of any beacon channel is allocated to $m^{(1)}$.
- If Block STTD antenna diversity is applied to P-CCPCH, for any beacon channel midambles $m^{(1)}$ and $m^{(2)}$ are each allocated half of the reference power. Midamble $m^{(1)}$ is used for the first antenna and $m^{(2)}$ is used for the diversity antenna. Block STTD encoding is used for the data in P-CCPCH, see [9]; for all other beacon channels identical data sequences are transmitted on both antennas.

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R1-01-0389

CR-Form-v3

CHANGE REQUEST

⌘ **25.224** **CR** **048** ⌘ rev **1** ⌘ Current version: **3.5.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	CR 25.224-048 Idle periods for IPDL location method
Source:	⌘	TSG RAN WG1
Work item code:	⌘	LCS1-UEpos-enh
Date:	⌘	23. Feb. 2001
Category:	⌘	**B**
Release:	⌘	REL-4

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C *(Functional modification of feature)*
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R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Introduction of IPDLs for UE positioning in UTRA TDD mode
Summary of change:	⌘	This CR introduces IPDLs for UTRA TDD mode.
Consequences if not approved:	⌘	IPDLs for the OTDOA UE positioning method are necessary for sufficient accuracy and coverage.

Clauses affected:	⌘	5; 5.1; 5.2; 5.3		
Other specs Affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.331
Other comments:	⌘			

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5 Idle periods for IPDL location method

5.1 General

To support time difference measurements for location services, idle periods can be created in the downlink (hence the name IPDL) during which time transmission of all channels from a Node B is temporarily ceased, except for the SCH transmission. During these idle periods the visibility of neighbour cells from the UE is improved.

The idle periods are arranged in a determined pattern according to higher layer parameters. An idle period has a duration of one time slot. During idle periods only the SCH is transmitted. No attempt is made to prevent data loss.

In general there are two modes for these idle periods:

- Continuous mode, and
- Burst mode.

In continuous mode the idle periods are active all the time. In burst mode the idle periods are arranged in bursts where each burst contains enough idle periods to allow a UE to make sufficient measurements for its location to be calculated. The bursts are separated by a period where no idle periods occur.

The time difference measurements can be performed on any channel. If the P-CCPCH falls in an idle slot, UTRAN may decide not to transmit the P-CCPCH in two consecutive frames, the first of these two frames containing the idle slot. This option is signalled by higher layers.

5.2 Parameters of IPDL

The following parameters are signalled to the UE via higher layers:

IP_Status: This is a logic value that indicates if the idle periods are arranged in continuous or burst mode.

IP_Spacing: The number of 10 ms radio frames between the start of a radio frame that contains an idle period and the next radio frame that contains the next idle period. Note that there is at most one idle period in a radio frame.

IP_Start: The number of the first frame with idle periods. In case of continuous mode IP_Start is the SFN of the first frame with idle periods and in case of burst mode IP_Start defines the number of frames after Burst_Start with the first frame with idle periods.

IP_Slot: The number of the slot that has to be idle [0..14].

IP_PCCPCH: This logic value indicates, if the P-CCPCH is switched off in two consecutive frames. The first of these two frames contains the idle period.

Additionally in the case of burst mode operation the following parameters are also communicated to the UE.

Burst_Start: The SFN where the first burst of idle periods starts.

Burst_Length: The number of idle periods in a burst of idle periods.

Burst_Freq: The number of radio frames between the start of a burst and the start of the next burst.

5.3 Calculation of idle period position

In burst mode, the first burst starts in the radio frame with SFN = Burst_Start. The n^{th} burst starts in the radio frame with SFN = Burst_Start + n×Burst_Freq. The sequence of bursts according to this formula continues up to and including the radio frame with SFN = 4095. At the start of the radio frame with SFN = 0, the burst sequence is

terminated (no idle periods are generated) and at SFN = Burst_Start the burst sequence is restarted with the first burst followed by the second burst etc., as described above.

Continuous mode is equivalent to burst mode, with only one burst spanning the whole SFN cycle of 4096 radio frames, this burst starts in the radio frame with SFN = 0. In case of continuous mode the parameter IP_Start defines the first frame with idle periods.

The time slot that has to be idle is defined by two values: IP_Frame(x) and IP_Slot. IP_Frame(x) defines the x^{th} frame within a burst in which the slot with the number IP_Slot has to be switched off.

The actual frame with idle periods within a burst is calculated as follows:

IP_Frame(x) = IP_Start + (x-1) × IP_Spacing with x = 1, 2, 3, ...

If the parameter IP_PCCPCH is set to 1, then the P-CCPCH will not be transmitted in the frame IP_Frame(x) +1 within a burst.

Figure 6 below illustrates the idle periods for the burst mode case, if the IP_P-CCPCH parameter is set to 0.

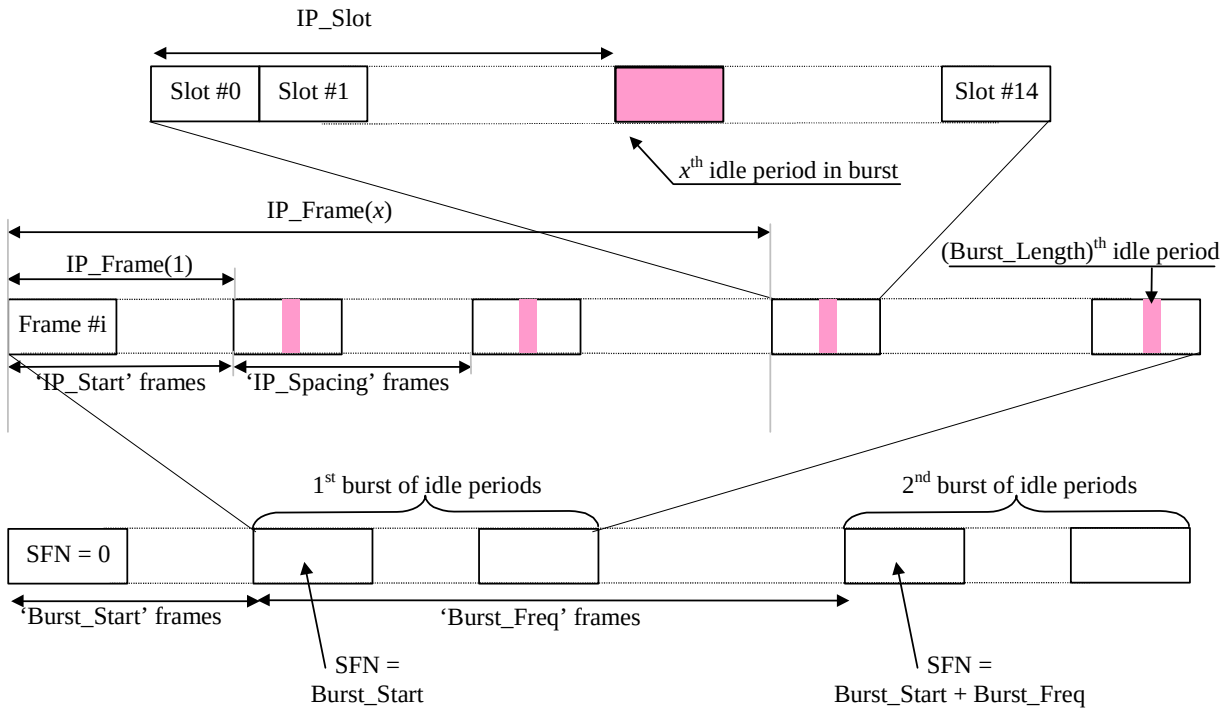

Figure 6: Idle Period placement in the case of burst mode operation with IP_P-CCPCH parameter set to 0

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R1-01-0229

CR-Form-v3

CHANGE REQUEST

⌘ **25.225 CR 025** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	CR 25.225-025 on RTD measurement in UTRAN for UP-TDD
Source:	⌘	TSG RAN WG1
Work item code:	⌘	LCS1-UEpos-enh
Date:	⌘	23. Feb. 2001
Category:	⌘	**B**
Release:	⌘	REL-4

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R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	RTD measurement is necessary to achieve sufficient accuracy for UP if the synchronisation of TDD cells fulfils only the minimum requirement.
Summary of change:	⌘	Introduction of RTD measurement.
Consequences if not approved:	⌘	RTD measurement is necessary for the OTDOA positioning methods.

Clauses affected:	⌘	5.2.10		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.331
Other comments:	⌘			

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5.2.10 SFN-SFN observed time difference

Definition	SFN-SFN observed time difference = T_{RxTSk} - T_{RxTSi}, in chips, where T_{RxTSi}: time of start (defined by the first detected path in time) of a timeslot received by the LMU from the TDD cell i. T_{RxTSk}: time of start (defined by the first detected path in time) of a timeslot received by the LMU from the cell k that is closest in time to the start of the received timeslot of the TDD cell i.