TSG-RAN Meeting #28
Quebec, Canada, 01-03 June 2005

RP-050301
agenda item 7.3.5

Source: TSG-RAN WG2

Title: CRs (Rel-5 & Rel-6) on HSDPA Corrections

The following CRs are in RP-050301:

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.321	0206	-	Rel-5	Correction of HSDPA state variable	F	5.10.0	5.11.0	R2-051152	HSDPA-L23
25.321	0207	-	Rel-6	Correction of HSDPA state variable	A	6.4.0	6.5.0	R2-051153	HSDPA-L23
25.321	0209	-	Rel-5	Reconfiguration of MAC-hs parameters	F	5.10.0	5.11.0	R2-051532	HSDPA-L23
25.321	0210	-	Rel-6	Reconfiguration of MAC-hs parameters	A	6.4.0	6.5.0	R2-051533	HSDPA-L23
34.109	0035	-	Rel-5	Clarification of loopback behaviour for uni-directional radio bearers	F	5.4.0	5.5.0	R2-051537	HSDPA-L23
34.109	0036	-	Rel-6	Clarification of loopback behaviour for uni-directional radio bearers	A	6.0.0	6.1.0	R2-051538	HSDPA-L23

3GPP TSG RAN WG2 #46bis
Beijing, China, 4-8 April 2005

Tdoc ⌘R2-051152

CR-Form-v7.1

CHANGE REQUEST

⌘ **25.321** **CR** **0206** ⌘**rev** **-** ⌘ Current version: **5.10.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Correction of HSDPA state variable
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	07/04/2005
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

Ph2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	In 11.6.2.3.1, it is defined that the state variable next_expected_TSN shall be updated upon the delivery to the disassembly entity of the MAC-hs PDU with TSN equal to next_expected_TSN. However, in 11.6.2.3.2, 11.6.2.5 and 11.6.2.6, there are additional situations that next_expected_TSN shall be updated.
Summary of change:	⌘	Definition of the state variable next_expected_TSN is corrected to cover the update situations described in 11.6.2.3.2, 11.6.2.5 and 11.6.2.6.
Consequences if not approved:	⌘	Specification is ambiguous and inconsistent, and may lead to poor UE behavior. **Isolated impact analysis:** UE does not implement the change: UE may not update next_expected_TSN appropriately if UE is implemented according to 11.6.2.3.1. There is no impact if UE is implemented according to 11.6.2.3.2, 11.6.2.5 and 11.6.2.6. Network does not implement the change: no impact.

Clauses affected:	⌘	11.6.2.3.1

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	

How to create CRs using this form:
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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

11.6.2.3.1 Definitions

In the functions described in this section the following definitions apply:

Parameters

- Transmitter window size (TRANSMIT_WINDOW_SIZE)
  TRANSMIT_WINDOW_SIZE is the size of the transmitter window according to the definition below. This is a parameter in the Node B and the value of the parameter is configured by higher layers.

- Receiver window size (RECEIVE_WINDOW_SIZE)
  RECEIVE_WINDOW_SIZE is the size of the receiver window according to the definition below. This is a parameter in the UE and the value of the parameter is configured by higher layers.

State variables

All state variables are non-negative integers. MAC-hs PDUs are numbered by modulo integer Transmission sequence numbers (TSN) cycling through the field 0 to 63. All arithmetic operations contained in the present document on next_expected_TSN, RcvWindow_UpperEdge, T1_TSN and TSN_flush are affected by the 64 modulus. When performing arithmetic comparisons of state variables or Transmission sequence number values a 64 modulus base shall be used. This modulus base is subtracted (within the appropriate field) from all the values involved and then an absolute comparison is performed. RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 shall be assumed to be the modulus base.

- next_expected_TSN:
  The next_expected_TSN is the Transmission sequence number (TSN) following the TSN of the last in-sequence MAC-hs PDU received. It shall be updated according to the procedures given in subclauses 11.6.2.3.2, 11.6.2.5 and 11.6.2.6. ~~upon the delivery to the disassembly entity of the MAC-hs PDU with TSN equal to next_expected_TSN.~~ The initial value of next_expected_TSN =0.

- RcvWindow_UpperEdge:
  The RcvWindow_UpperEdge represents the TSN, which is at the upper edge of the receiver window. After the first MAC-hs PDU has been received successfully, it also corresponds to the MAC-hs PDU with the highest TSN of all received MAC-hs PDUs. The initial RcvWindow_UpperEdge equals 63. RcvWindow_UpperEdge is updated based on the reception of new MAC-hs PDU according to the procedure given below.

- T1_TSN:
  The TSN of the latest MAC-hs PDU that cannot be delivered to the disassembly entity, when the timer T1 is started.

3GPP TSG RAN WG2 #46bis
Beijing, China, 4-8 April 2005

Tdoc ⌘R2-051153

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CHANGE REQUEST

⌘ **25.321** **CR** **0207** ⌘**rev** **-** ⌘ Current version: **6.4.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Correction of HSDPA state variable
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	07/04/2005
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
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Use one of the following releases:

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R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*
Rel-7	*(Release 7)*

Reason for change:	⌘	In 11.6.2.3.1, it is defined that the state variable next_expected_TSN shall be updated upon the delivery to the disassembly entity of the MAC-hs PDU with TSN equal to next_expected_TSN. However, in 11.6.2.3.2, 11.6.2.5 and 11.6.2.6, there are additional situations that next_expected_TSN shall be updated.
Summary of change:	⌘	Definition of the state variable next_expected_TSN is corrected to cover the update situations described in 11.6.2.3.2, 11.6.2.5 and 11.6.2.6.
Consequences if not approved:	⌘	Specification is ambiguous and inconsistent, and may lead to poor UE behavior. **Isolated impact analysis:** UE does not implement the change: UE may not update next_expected_TSN appropriately if UE is implemented according to 11.6.2.3.1. There is no impact if UE is implemented according to 11.6.2.3.2, 11.6.2.5 and 11.6.2.6. Network does not implement the change: no impact.

Clauses affected:	⌘	11.6.2.3.1			
Other specs affected:	⌘	**Y**	**N**		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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11.6.2.3.1 Definitions

In the functions described in this section the following definitions apply:

Parameters

- Transmitter window size (TRANSMIT_WINDOW_SIZE)
  TRANSMIT_WINDOW_SIZE is the size of the transmitter window according to the definition below. This is a parameter in the Node B and the value of the parameter is configured by higher layers.

- Receiver window size (RECEIVE_WINDOW_SIZE)
  RECEIVE_WINDOW_SIZE is the size of the receiver window according to the definition below. This is a parameter in the UE and the value of the parameter is configured by higher layers.

State variables

All state variables are non-negative integers. MAC-hs PDUs are numbered by modulo integer Transmission sequence numbers (TSN) cycling through the field 0 to 63. All arithmetic operations contained in the present document on next_expected_TSN, RcvWindow_UpperEdge, T1_TSN and TSN_flush are affected by the 64 modulus. When performing arithmetic comparisons of state variables or Transmission sequence number values a 64 modulus base shall be used. This modulus base is subtracted (within the appropriate field) from all the values involved and then an absolute comparison is performed. RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 shall be assumed to be the modulus base.

- next_expected_TSN:
  The next_expected_TSN is the Transmission sequence number (TSN) following the TSN of the last in-sequence MAC-hs PDU received. It shall be updated according to the procedures given in subclauses 11.6.2.3.2, 11.6.2.5 and 11.6.2.6. ~~upon the delivery to the disassembly entity of the MAC-hs PDU with TSN equal to next_expected_TSN.~~ The initial value of next_expected_TSN =0.

- RcvWindow_UpperEdge:
  The RcvWindow_UpperEdge represents the TSN, which is at the upper edge of the receiver window. After the first MAC-hs PDU has been received successfully, it also corresponds to the MAC-hs PDU with the highest TSN of all received MAC-hs PDUs. The initial RcvWindow_UpperEdge equals 63. RcvWindow_UpperEdge is updated based on the reception of new MAC-hs PDU according to the procedure given below.

- T1_TSN:
  The TSN of the latest MAC-hs PDU that cannot be delivered to the disassembly entity, when the timer T1 is started.

3GPP TSG-RAN2 Meeting #47
Athens, Greece, 9-13 May 2005

Tdoc ⌘R2-051532

CR-Form-v7.1

CHANGE REQUEST

⌘ **25.321** **CR** **0209** ⌘**rev** **-** ⌘ Current version: **5.10.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Reconfiguration of MAC-hs parameters
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	03/05/2005
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change: ⌘

In current subclause 11.6.2.6, when the parameter RECEIVE_WINDOW_SIZE is reconfigured for a re-ordering queue, the condition for updating next_expected_TSN and delivering in-sequence received MAC-hs PDU on and after the updated next_expected_TSN is specified to be: “if next_expected_TSN <= RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE”.

By the modulus convention for arithmetic comparisons of state variables defined in subclause 11.6.2.3.1, where RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 is assumed to be the modulus base, the above checking condition will always be true. This can be seen by the following example.

Suppose that RECEIVE_WINDOW_SIZE is reconfigured from 16 to be 8 when RcvWindow_UpperEdge = 3 and next_expected_TSN = 4, (i.e. all received PDUs have been delivered to upper entity) where next_expected_TSN is above the receiver window so that no update of next_expected_TSN should be performed after reconfiguration.
However, in this example, RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE = (3 – 8) mod 64 = 59 and modulus base = RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 = (3 – 8 +1) mod 64 = 60. Thus, the above mentioned condition is tested as: (4 – 60) mod 64 <= (59 – 60) mod 64, which is 8 <= 63, which is true. By the current specification, next_expected_TSN is set to (updated to) 60; MAC-hs PDUs of TSN = 60 up to and including 3 are delivered to upper entity; and next_expected_TSN is advanced to 4 again.

In other words, the current specification misleads UE to erronously change

		next_expected_TSN down to RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 and deliver, for a second time, the received in-sequence PDUs with TSN on and after the updated next_expected_TSN. This will induce HFN de-synchronization problem for UM radio bearers. The original intention of the above mentioned condition should be “if next_expected_TSN is below the receiver window after its size is updated”.
Summary of change:	⌘	The above checking condition is corrected to reflect its original intention. **Isolated Impact Change Analysis:** This change only impacts the behaviour of reconfiguring MAC-hs parameter RECEIVE_WINDOW_SIZE. Does not affect implementation behaving like indicated in the CR, would affect implementations behaving otherwise, wherein HFN de-synchronization problem might be induced.
Consequences if not approved:	⌘	The specification specifies an incorrect behavior when reconfiguring the MAC-hs parameter RECEIVE_WINDOW_SIZE.

Clauses affected:	⌘	11.6.2.6			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

11.6.2.6 Reconfiguration of MAC-hs parameters

The parameters for a MAC-hs entity may be reconfigured (modifed) by upper layers.

When a parameter is reconfigured by the upper layer, the UE shall:

- start using the reconfigured value of the parameter at the activation time indicated by higher layers.

If the parameter T1 is reconfigured for an already existing re-ordering queue, the UE shall:

- start to use the new value of T1 the next time T1 is started.

If the MAC-d PDU size info (i.e. mapping of MAC-d PDU size index to MAC-d PDU size) is reconfigured for an already existing re-ordering queue, at the activation time indicated by higher layers, the UE shall:

- stop timer T1 if running;
- set next_expected_TSN to (highest TSN of received MAC-hs PDU of this re-ordering queue + 1);
- deliver all correctly received MAC-hs PDUs in this re-ordering queue to the disassembly entity and use the old MAC-d PDU size info for these MAC-hs PDUs.

If the parameter RECEIVE_WINDOW_SIZE is reconfigured for a re-ordering queue, the UE shall:

- set RECEIVE_WINDOW_SIZE to the new value;
- remove any MAC-hs PDUs in this re-ordering queue with TSN ≤ RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE (i.e. outside the receiver window after its size is updated) from the reordering buffer and deliver these MAC-hs PDUs to the disassembly entity;
- if next_expected_TSN is below the receiver window after its size is updated ~~≤ RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE~~:
  - set next_expected_TSN to RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1;
  - deliver all received MAC-hs PDUs in this re-ordering queue with consecutive TSNs from next_expected_TSN (included) up to the first not received MAC-hs PDU to the disassembly entity;
  - advance next_expected_TSN to the TSN of this first not received MAC-hs PDU.

If the "Memory Partitioning" (see [7]) for soft buffer is reconfigured, the UE shall:

- flush soft buffer for all configured HARQ processes.

3GPP TSG-RAN2 Meeting #47
Athens, Greece, 9-13 May 2005

Tdoc ⌘R2-051533

CR-Form-v7.1

CHANGE REQUEST

⌘ **25.321** **CR** **0210** ⌘**rev** **-** ⌘ Current version: **6.4.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Reconfiguration of MAC-hs parameters
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	03/05/2005
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:
Ph2 *(GSM Phase 2)*
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R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change: ⌘

In current subclause 11.6.2.6, when the parameter RECEIVE_WINDOW_SIZE is reconfigured for a re-ordering queue, the condition for updating next_expected_TSN and delivering in-sequence received MAC-hs PDU on and after the updated next_expected_TSN is specified to be: “if next_expected_TSN <= RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE”.

By the modulus convention for arithmetic comparisons of state variables defined in subclause 11.6.2.3.1, where RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 is assumed to be the modulus base, the above checking condition will always be true. This can be seen by the following example.

Suppose that RECEIVE_WINDOW_SIZE is reconfigured from 16 to be 8 when RcvWindow_UpperEdge = 3 and next_expected_TSN = 4, (i.e. all received PDUs have been delivered to upper entity) where next_expected_TSN is above the receiver window so that no update of next_expected_TSN should be performed after reconfiguration.
However, in this example, RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE = (3 – 8) mod 64 = 59 and modulus base = RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 = (3 – 8 +1) mod 64 = 60. Thus, the above mentioned condition is tested as: (4 – 60) mod 64 <= (59 – 60) mod 64, which is 8 <= 63, which is true. By the current specification, next_expected_TSN is set to (updated to) 60; MAC-hs PDUs of TSN = 60 up to and including 3 are delivered to upper entity; and next_expected_TSN is advanced to 4 again.

In other words, the current specification misleads UE to erronously change

		next_expected_TSN down to RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1 and deliver, for a second time, the received in-sequence PDUs with TSN on and after the updated next_expected_TSN. This will induce HFN de-synchronization problem for UM radio bearers. The original intention of the above mentioned condition should be “if next_expected_TSN is below the receiver window after its size is updated”.
Summary of change:	⌘	The above checking condition is corrected to reflect its original intention. **Isolated Impact Change Analysis:** This change only impacts the behaviour of reconfiguring MAC-hs parameter RECEIVE_WINDOW_SIZE. Does not affect implementation behaving like indicated in the CR, would affect implementations behaving otherwise, wherein HFN de-synchronization problem might be induced.
Consequences if not approved:	⌘	The specification specifies an incorrect behavior when reconfiguring the MAC-hs parameter RECEIVE_WINDOW_SIZE.

Clauses affected:	⌘	11.6.2.6			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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11.6.2.6 Reconfiguration of MAC-hs parameters

The parameters for a MAC-hs entity may be reconfigured (modifed) by upper layers.

When a parameter is reconfigured by the upper layer, the UE shall:

- start using the reconfigured value of the parameter at the activation time indicated by higher layers.

If the parameter T1 is reconfigured for an already existing re-ordering queue, the UE shall:

- start to use the new value of T1 the next time T1 is started.

If the MAC-d PDU size info (i.e. mapping of MAC-d PDU size index to MAC-d PDU size) is reconfigured for an already existing re-ordering queue, at the activation time indicated by higher layers, the UE shall:

- stop timer T1 if running;
- set next_expected_TSN to (highest TSN of received MAC-hs PDU of this re-ordering queue + 1);
- deliver all correctly received MAC-hs PDUs in this re-ordering queue to the disassembly entity and use the old MAC-d PDU size info for these MAC-hs PDUs.

If the parameter RECEIVE_WINDOW_SIZE is reconfigured for a re-ordering queue, the UE shall:

- set RECEIVE_WINDOW_SIZE to the new value;
- remove any MAC-hs PDUs in this re-ordering queue with TSN ≤ RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE (i.e. outside the receiver window after its size is updated) from the reordering buffer and deliver these MAC-hs PDUs to the disassembly entity;
- if next_expected_TSN is below the receiver window after its size is updated ~~≤ RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE~~:
  - set next_expected_TSN to RcvWindow_UpperEdge – RECEIVE_WINDOW_SIZE + 1;
  - deliver all received MAC-hs PDUs in this re-ordering queue with consecutive TSNs from next_expected_TSN (included) up to the first not received MAC-hs PDU to the disassembly entity;
  - advance next_expected_TSN to the TSN of this first not received MAC-hs PDU.

If the "Memory Partitioning" (see [7]) for soft buffer is reconfigured, the UE shall:

- flush soft buffer for all configured HARQ processes.

3GPP TSG-RAN WG2 Meeting #47
Athens, Greece, 9th - 13th May 2005

Tdoc ⌘ R2-051537

CR-Form-v7

CHANGE REQUEST

⌘ **34.109** **CR** **0035** ⌘ **rev** **-** ⌘ Current version: **5.4.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of loopback behaviour for uni-directional radio bearers
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	11/05/2005
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
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R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change: ⌘

1. The current specification does not define what should happen with user plane data that is received on a radio bearer before a loop is closed.
2. The current specification does not define how loopback should work for unidirectional user plane radio bearers such as used for the HS-PDSCH shared data channel for HSDPA.
3. The current specification does not define whether the loopback delay requirement applies if loopback type 1 is closed on both a transparent and unacknowledged mode radio bearer.
4. The current specification does not adequately describe UE behaviour when multiple user plane radio bearers are active.

Summary of change: ⌘

The text is modified to clarify that data shall be discarded if it is received on a user plane radio bearer that is not looped back.

The text is modified to clarify that loopback applies only when there is at least one bidirectional user plane radio bearer is configured and that unidirectional bearers are not looped back.

The text is modified to clarify that the loopback type 1 delay requirement applies to each user plane radio bearer that is configured for transparent RLC and MAC operation.

The text is modified to fully take account of multiple user plane radio bearers.

		The use of the term “user plane” to describe the radio bearer is standardised so as to emphasise that the loopback function does not apply to signalling radio bearers.
Consequences if not approved:	⌘	Testing of HSDPA and other services involving unidirectional user plane radio bearers would have to be done using configurations that do not match those defined in the core requirements against which the minimum performance has been specified. Such signals add confusion and complexity to the test setup which is neither essential nor desirable.

Clauses affected:	⌘	5.1, 5.2, 5.3			
Other specs Affected:	⌘	**Y** / **N**		⌘	
			Other core specifications		
		X /	Test specifications		34.121
		/ **X**	O&M Specifications		
Other comments:	⌘	This CR is applicable for Rel-5 and later releases.			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5 Test Control (TC) protocol procedures and test loop operation

5.1 General description

The UE test loop function provides access to isolated functions of the UE via the radio interface without introducing new physical interfaces just for the reason of conformance testing.

NOTE: It should be emphasised that the UE test loop function only describes the functional behaviour of the UE with respect to its external interfaces; physical implementation of the UE test loop function is completely left open to the manufacturer.

The UE test loop function is activated by transmitting the appropriate Test Control (TC) message to the UE, see clause 6.

For the purposes of this specification only, the following definitions are used:

Bidirectional Radio Bearer:

If the "RB mapping info" information element ([5] subclause 10.3.4.21) for the currently active configuration of a radio bearer includes mappings to both uplink and downlink transport channels then this radio bearer is defined to be a bidirectional radio bearer.

Unidirectional Radio Bearer:

If the "RB mapping info" information element ([5] subclause 10.3.4.21) for the currently active configuration of a radio bearer includes mappings to only uplink or downlink transport channels then this radio bearer is defined to be a unidirectional radio bearer.

NOTE: This definition of unidirectional radio bearer is only applicable to RLC Unacknowledged Mode, in this version of the specification.

The UE test loop function can be operated in two different loopback modes:

- UE test loop mode 1; and
- UE test loop mode 2.

Figure 5.1.1 shows a functional block diagram of UE test loop function for mode 1.

For UE test loop mode 1 the loopback point is located above Layer 2. Depending on the actual radio bearer setup loopback is performed of RLC SDUs or PDCP SDUs according to the procedure specified in subclause 5.3.3.2.

The loop back point for UE test loop mode 1 has been selected above Layer 2 to separate the protocol configurations from the UE test loop function. By configuration of RLC and MAC layers other loop back points may functional be achieved. E.g. by transparent configuration of RLC and MAC layer functional loop back point at Transport channel level can be achieved to implement the reference measurement channels as specified by TS 34.121 [8], Annex C for FDD and by TS 34.122 [9], Annex C for TDD.

For UE test loop mode 2 both data and CRC are looped back. UE test loop mode 2 is intended for Blind Transport Format Detection (BTFD) testing and BLER testing of DL 12.2 kbps reference measurement channel for which loopback of downlink CRC is required. UE test loop mode 2 can also be used for BLER testing of DL 64, 144 and 384 kbps reference measurement channels if the UE supports correspondent UL reference measurement channels. Both received data and CRC bits for the DCH transport channel used for the BTFD test case is returned according to the procedure specified in subclause 5.3.3.3.

A specific radio bearer test mode is specified to be used together with the UE test loop function. The purpose of the radio bearer test mode is to put the UE into a mode where: SS can set up radio bearers to be terminated in the UE test loop function without having to involve CC or SM; and to disable any control mechanisms in NAS protocols or in any UE applications that otherwise could cause the RRC connection to be released.

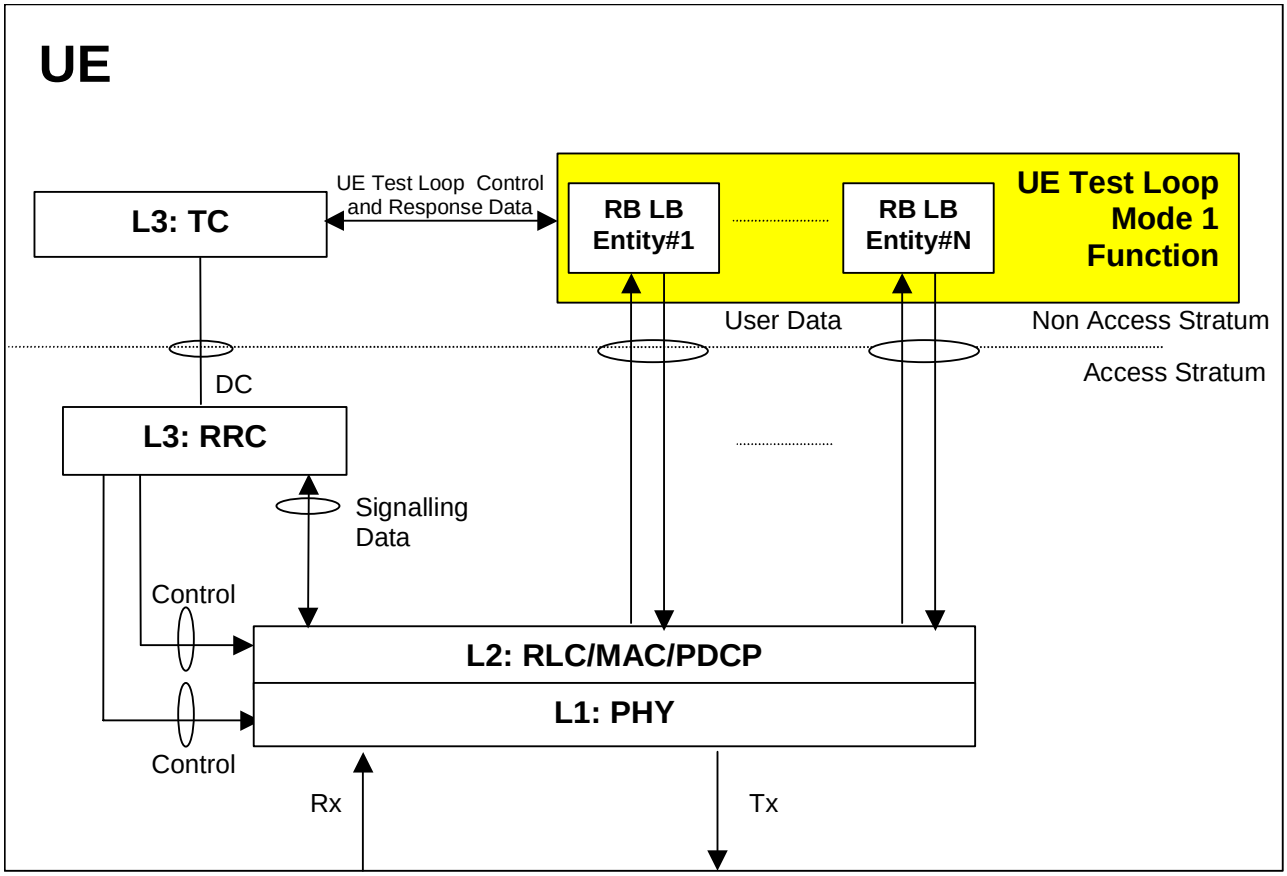

Figure 5.1.1: UE Test Loop Mode 1 function (TC =Test Control, LB = Loop Back entity)

5.2 UE radio bearer test mode procedures

5.2.1 Activate UE radio bearer test mode

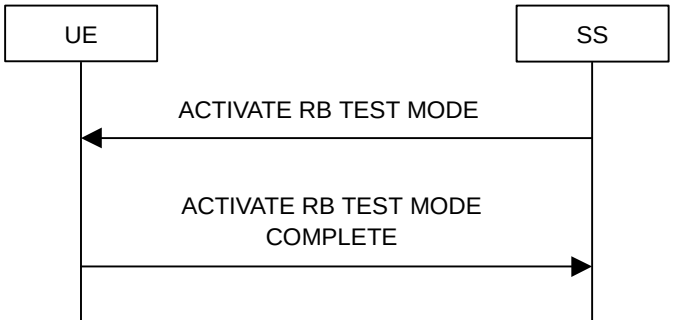

Figure 5.2.1.1: Activate UE radio bearer test mode procedure

5.2.1.1 General

The SS uses the activate UE radio bearer procedure to get the UE into a test mode where: the SS can set up radio bearers to be terminated in the UE test loop function without having to involve CC or SM; and to disable any control mechanisms in NAS protocols (TC protocol excluded) or in any UE applications that otherwise could cause the RRC connection to be released.

5.2.1.2 Initiation

The SS can initiate the UE radio bearer test mode when an RRC connection is established.

The SS requests the UE to activate the UE radio bearer test mode by transmitting an ACTIVATE RB TEST MODE message. The SS then starts timer TT01.

5.2.1.3 Reception of ACTIVATE RB TEST MODE message by UE

When the UE receives the ACTIVATE RB TEST MODE message then the radio bearer test mode shall be activated.

When the radio bearer test mode is active the UE shall:

- accept any requested radio bearer setup within the radio access capabilities of the UE;
- terminate all user plane radio bearer(s) in the UE test loop function; and
- discard all SDUs delivered by the RLC layer to the UE test loop function for a radio bearer without a closed test loop if the configuration of that radio bearer does not include the PDCP layer; and
- discard all SDUs delivered by the PDCP layer to the UE test loop function for a radio bearer without a closed test loop if the configuration of that radio bearer includes the PDCP layer (configured by "PDCP info" (see [5]); and
- disable any control mechanisms in NAS protocols or in any UE applications that otherwise could cause the RRC connection to be released.

When the radio bearer test mode has been activated the UE shall transmit the ACTIVATE RB TEST MODE COMPLETE message.

NOTE: When the radio bearer test mode is active the UE does not need to provide any CC or SM functionality.

5.2.1.4 Reception of ACTIVATE RB TEST MODE COMPLETE message by SS

Upon reception of the ACTIVATE RB TEST MODE COMPLETE message the SS stops timer TT01.

The reception of the ACTIVATE RB TEST MODE COMPLETE message by SS confirms that the UE radio bearer test mode has been activated in the UE.

5.2.1.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

5.2.2 Deactivate UE radio bearer test mode

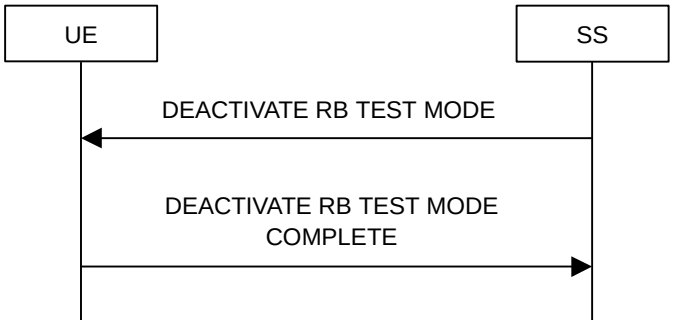

Figure 5.2.2.1: Deactivate UE radio bearer test mode procedure

5.2.2.1 General

The purpose of this procedure is to deactivate the radio bearer test mode and return UE to normal operation.

5.2.2.2 Initiation

The SS can deactivate the UE radio bearer test mode when an RRC connection is established and the UE radio bearer test mode is active.

The SS requests the UE to deactivate the UE radio bearer test mode by transmitting a DEACTIVATE RB TEST MODE message. The SS then starts timer TT01.

5.2.2.3 Reception of DEACTIVATE RB TEST MODE message by UE

When the UE receives DEACTIVATE RB TEST MODE message then the radio bearer test mode shall be deactivated and UE shall be returned to normal operation.

When the UE has deactivated the radio bearer test mode the UE shall transmit the DEACTIVATE RB TEST MODE COMPLETE message using the RRC UPLINK DIRECT TRANSFER message.

5.2.2.4 Reception of DEACTIVATE RB TEST MODE COMPLETE message by SS

Upon reception of the DEACTIVATE RB TEST MODE COMPLETE message the SS stops timer TT01.

The reception of DEACTIVATE RB TEST MODE COMPLETE message by SS confirms that the UE radio bearer test mode has been deactivated in the UE.

5.2.2.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

5.3 UE test loop procedures

5.3.1 General

The UE test loop function is intended for:

- Testing of receiver characteristics based on BER (Bit Error Ratio) measurement. The SS calculates BER from a bit-by-bit comparison of data sent to and received from UE. BER measurement requires symmetric RAB bit-rates.
- Testing of receiver performance based on BLER (BLock Error Ratio) measurement. The SS calculates BLER based on the RLC STATUS SDU received from the UE operating in RLC acknowledged mode; or the SS calculates BLER based on checking returned downlink data and downlink CRC by UE operating in UE test loop mode 2.
- Testing of UE Blind Transport Format Detection.
- Testing of UE transmitter characteristics.
- Testing of UE transmitter DTX characteristics.
- Testing of radio bearers (UE test loop function emulates terminal equipment).

5.3.2 Close UE test loop

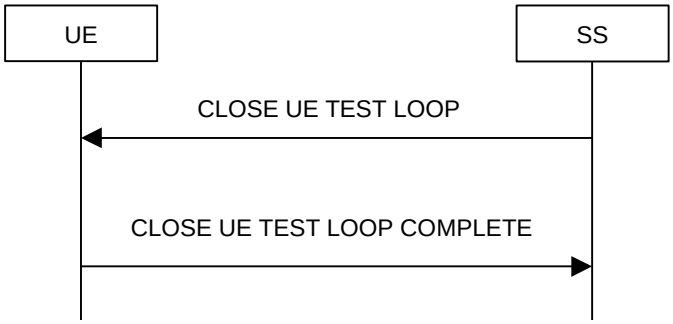

Figure 5.3.2.1: Close UE test loop procedure

5.3.2.1 General

The SS uses the close UE test loop procedure to start the UE Test Loop function in the UE. A prerequisite is that at least one bidirectional user plane radio bearer has been established between SS and UE. See TS 34.108 [10], clause 7 for generic setup procedures.

The UE shall provide for normal Uu layer 1, layer 2 and RRC functionality while the UE test loop function is active. This includes (but is not limited to) handover procedures and normal disconnection of the radio bearer. The loopback shall be maintained across handovers, but after radio bearer disconnection, the loopback shall cease to exist.

5.3.2.2 Initiation

The SS can request the UE to close a test loop if at least one bidirectional user plane radio bearer is established and the UE radio bearer test mode is active.

The SS requests the UE to close its radio bearer test loop by transmitting a CLOSE UE TEST LOOP message. The SS then starts timer TT01.

5.3.2.3 Reception of CLOSE UE TEST LOOP message by the UE

If no user plane bidirectional radio bearers are ~~is~~ established or the UE radio bearer test mode is not active, then the UE shall ignore any CLOSE UE TEST LOOP message.

If ~~a~~ one or more user plane bidirectional radio bearers are ~~is~~ established, the UE shall close the test loop on all user plane bidirectional radio bearers and then send back to the SS a CLOSE UE TEST LOOP COMPLETE message. The loopback shall be operational prior to the sending of the acknowledgement. The UE shall not close the test loop on any unidirectional user plane radio bearers.

If the test loop is already closed on one or more user plane radio bearers, the UE shall still respond as if the loop had been open, i.e. the CLOSE UE TEST LOOP COMPLETE message shall be sent.

NOTE: There is no requirement on the UE to read the content of the CLOSE UE TEST LOOP message if it is received while the test loop is closed.

If UE test loop mode 1 has been selected then the loop back scheme according to subclause 5.3.2.6 shall be performed by the UE.

If UE test loop mode 2 has been selected then the loop back scheme according to subclause 5.3.2.7 shall be performed by the UE.

5.3.2.4 Reception of CLOSE UE TEST LOOP COMPLETE message by the SS

Upon reception of the CLOSE UE TEST LOOP COMPLETE message the SS stops timer TT01.

5.3.2.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

5.3.2.6 UE test loop mode 1 operation

If the configuration of a user plane radio bearer with a closed UE test loop mode 1 includes the PDCP protocol layer, configured by "PDCP info" (see ~~TS 25.331~~ [5]), then the loop back scheme according to subclause 5.3.2.6.1 shall be performed by the UE for that~~e actual~~ radio bearer.

If the PDCP protocol layer is not used for a user plane radio bearer with a closed UE test loop mode 1 then the loop back scheme according to subclause 5.3.2.6.2 shall be performed by the UE for that~~e actual~~ radio bearer.

5.3.2.6.1 Loopback of PDCP SDUs

If UE test loop mode 1 has~~ve~~ been ~~selected~~ closed on a user plane radio bearer and the setup of that radio bearer ~~setup~~ includes configuration of PDCP protocol layer, configured by "PDCP info" (see ~~TS 25.331~~ [5]), then the following loop back scheme shall be performed by the UE.

After the UE has closed ~~its radio bearer~~ UE test loop mode 1 on a user plane radio bearer, every PDCP SDU received by the UE on that~~e active~~ radio bearer (downlink) shall be taken from the output of the PDCP service access point (SAP) and be input to the correspondent PDCP SAP and transmitted (uplink).

The UE shall provide for normal PDCP operation.

The PDCP loopback operation is illustrated in figure 5.3.2.6.1.1.

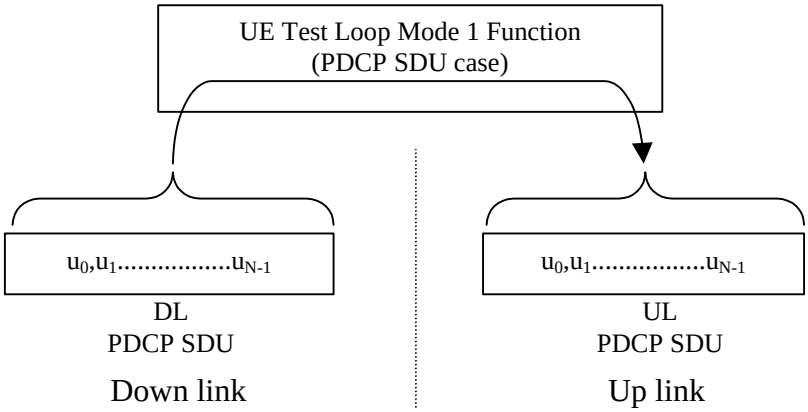

Figure 5.3.2.6.1.1: Loop back of PDCP SDU
(DL RLC SDU size = UL RLC SDU size = N)

5.3.2.6.2 Loopback of RLC SDUs

If UE test loop mode 1 has been ~~selected~~ closed on a user plane radio bearer and the setup of that radio bearer ~~setup~~ does not include configuration of the PDCP protocol layer ("PDCP info" is not configured~~. S~~(see ~~TS 25.331~~ [5]) then the following loop back scheme shall be performed by the UE.

After the UE has closed ~~its radio bearer~~ UE test loop mode 1 on a user plane radio bearer, every user data block received by the UE on that~~e active~~ radio bearer (downlink) shall be taken from the output of the RLC service access point (SAP) and be input to the correspondent RLC SAP and transmitted (uplink). The UE reads the UL RLC SDU size parameter from the "LB Setup RB IE#k" parameter associated with that~~e~~ radio bearer, see subclause 6.2.

If no "LB Setup RB IE#k" parameter is associated with that~~e~~ radio bearer then the UE shall use the same UL RLC SDU size as the received DL RLC SDU.

For the case when the "UL RLC SDU size" parameter is set to "0" no data shall be returned.

For the case when the "UL RLC SDU size" parameter is set to the same value as the down link (DL) RLC SDU block size then the complete user data block shall be returned, see figure 5.3.2.6.2.1.

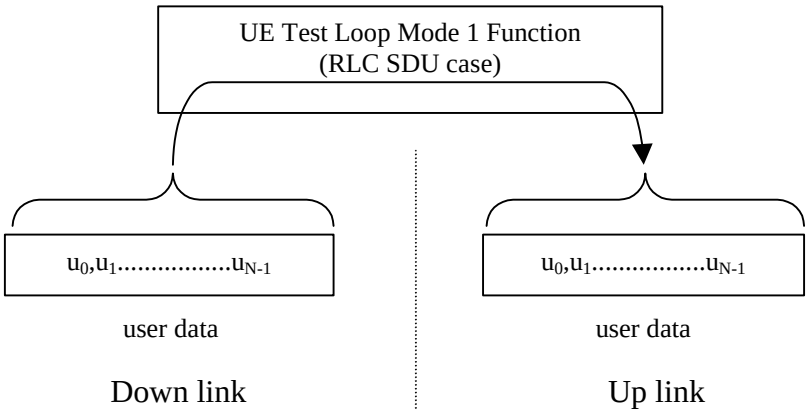

Figure 5.3.2.6.2.1: DL and UL RLC SDU block size equal (DL RLC SDU size = UL RLC SDU size = N)

For the case when the "UL RLC SDU size" parameter is set to a value less than the down link (DL) RLC SDU block size then the UE shall return the first K bits of the received block, where K is the UL block size, see figure 5.3.2.6.2.2.

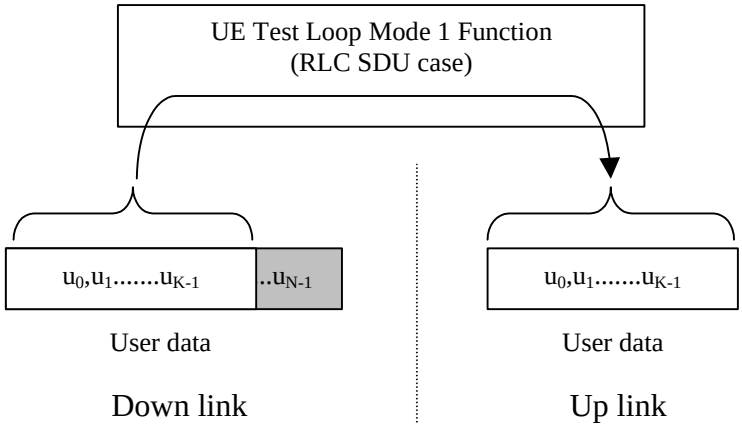

Figure 5.3.2.6.2.2: DL > UL RLC SDU block size (DL RLC SDU size = N, UL RLC SDU size = K)

For the case when the "UL RLC SDU size" parameter is set to a value bigger than the down link (DL) RLC SDU block size then the UE shall pad the UL send block by repeating the received data block until the UL send block has been filled (truncating the last block if necessary), see figure 5.3.2.6.2.3.

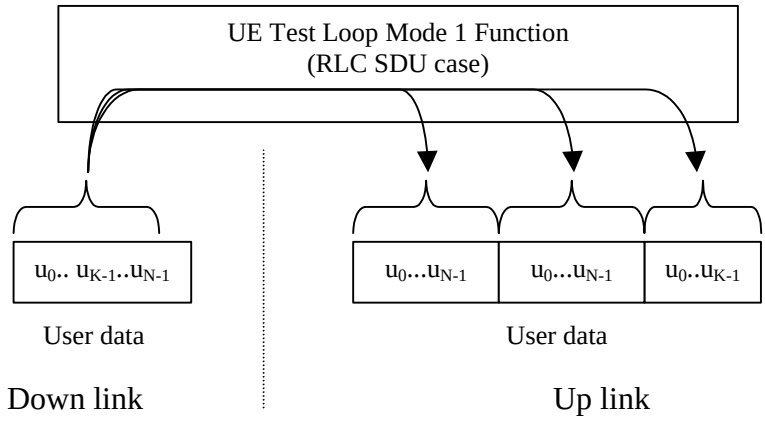

Figure 5.3.2.6.2.3: DL < UL RLC SDU block size (DL RLC SDU size = N, UL RLC SDU size = 2*N + K)

5.3.2.7 UE test loop mode 2 operation

For UE test loop mode 2 to work correctly ciphering shall be disabled.

For the UE to be able to return downlink transport block data and CRC bits then the up link transport channel configuration shall include a transport format for which the block size is equal to or bigger than the sum of the downlink transport block size and the number of downlink CRC bits. If no such uplink transport format exists then the returned data and CRC bits will be truncated.

5.3.2.7.1 Loopback of downlink transport block data and downlink CRC

If UE test loop mode 2 has been ~~selected~~ closed on a user plane radio bearer then the following loop back scheme shall be performed by the UE for all transport channels associated with a single DTCH:

After the UE has closed ~~the~~ test loop mode 2 on a user plane radio bearer then the UE shall copy the ~~received~~ downlink transport block and CRC bits received on that radio bearer to the up-link transport block and transmit in the up-link transport channel configured for that radio bearer.

If the uplink ~~radio bearer~~ configuration for that radio bearer is of variable rate then the transport format with the smallest transport block size which fits the downlink transport block size and the downlink CRC bits shall be selected ~~in~~ for the uplink. In case there is no uplink transport format that fits the downlink transport block data and the downlink CRC bits then the data and CRC bits shall be truncated using the transport format with the biggest transport block size configured for that uplink transport channel.

UE test loop mode 2 operation is illustrated for the case when the uplink transport block size is bigger than the sum of the downlink transport block size and size of downlink CRC in figure 5.3.2.7.1.

UE test mode 2 operation is illustrated for the case when uplink transport block size is smaller than the sum of downlink transport block size and size of downlink CRC in figure 5.3.2.7.2.

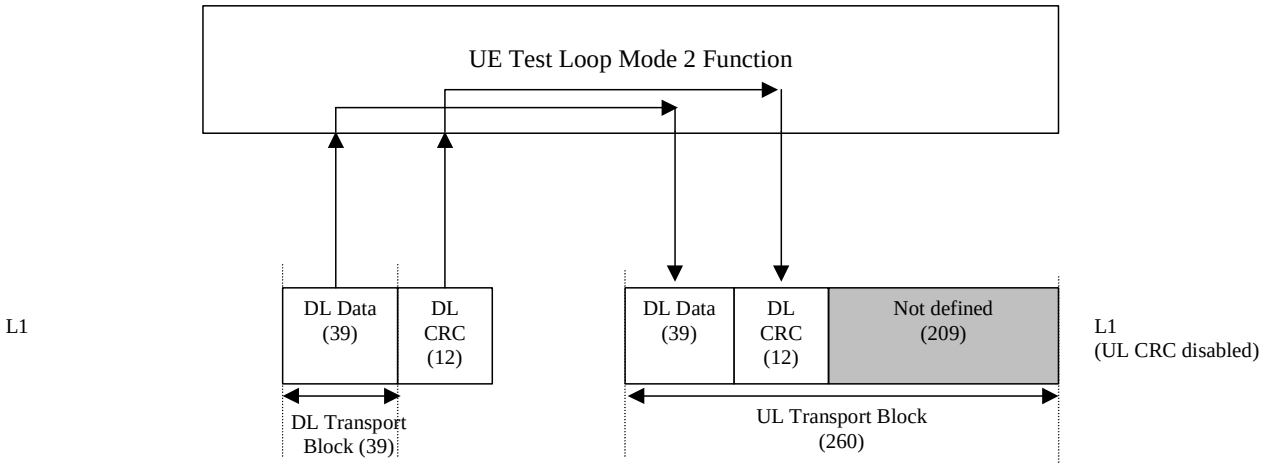

Figure 5.3.2.7.1. UE test loop mode 2 operation for the case when uplink transport block size is bigger than the sum of downlink transport block size and size of downlink CRC

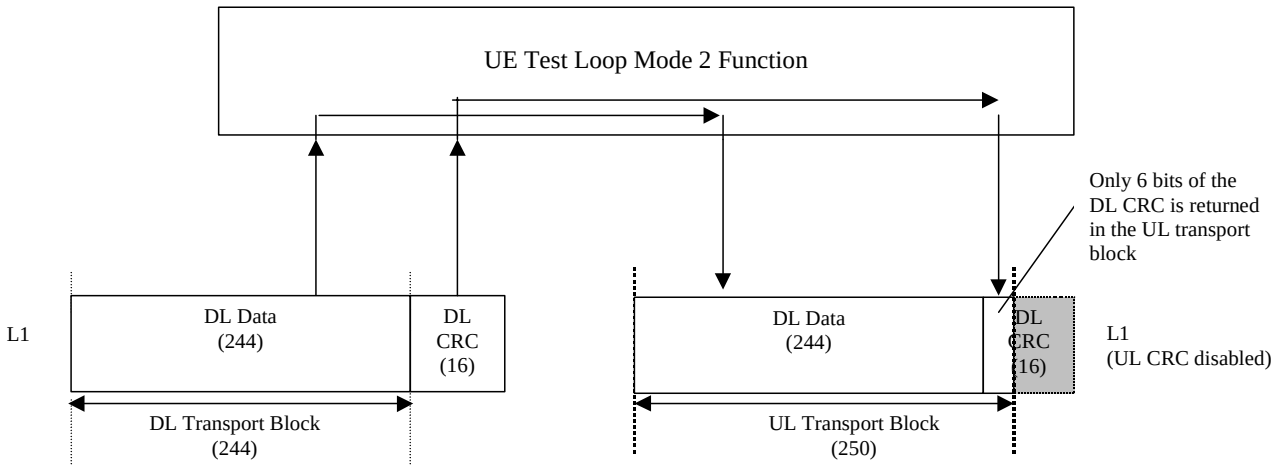

Figure 5.3.2.7.2. UE test loop mode 2 operation for the case when uplink transport block does not fit downlink transport block and downlink CRC bits.

5.3.2.8 Void

5.3.2.9 Loopback delay requirement

5.3.2.9.1 General loopback delay requirement

Loopback delay is specified as delay between received DL radio frames and their corresponding UL radio frames produced from the received data. The loopback delay is measured at the antenna connector of the UE and specified in the unit of radio frame(s). Timing offset between DL and UL radio frames, and timing errors are not included in the loopback delay.

For UE operating in UE test loop mode 1 the loopback delay requirement is applicable for a radio bearer with a closed test loop if the MAC and RLC protocols for that radio bearer are configured for transparent operation and if the downlink RLC SDU size is equal to the downlink transport block size, i.e. no segmentation/concatenation takes place.

For UE operating in UE test loop mode 2 the loopback delay requirement is applicable ~~independent of the~~ for any radio bearer configuration.

~~While the UE test loop is closed and the radio bearer configuration is not changed, t~~The UE shall maintain a fixed loopback delay (the loopback delay shall not vary during a test) if the configuration of radio bearers with closed test loops remains unchanged. The loopback delay shall not exceed the number of radio frames correspondent to 10 times the TTI of the actual transport channel configuration.

The loopback delay requirement for the 10ms TTI case is illustrated in figure 5.3.2.9.1.

NOTE 1: See TS 25.211 [11], subclause 7.6.3 for definition of the timing offset between DL and UL radio frames for FDD mode.

NOTE 2: See TS 25.133 [12], subclause 7.1 for definition of the timing error for FDD mode.

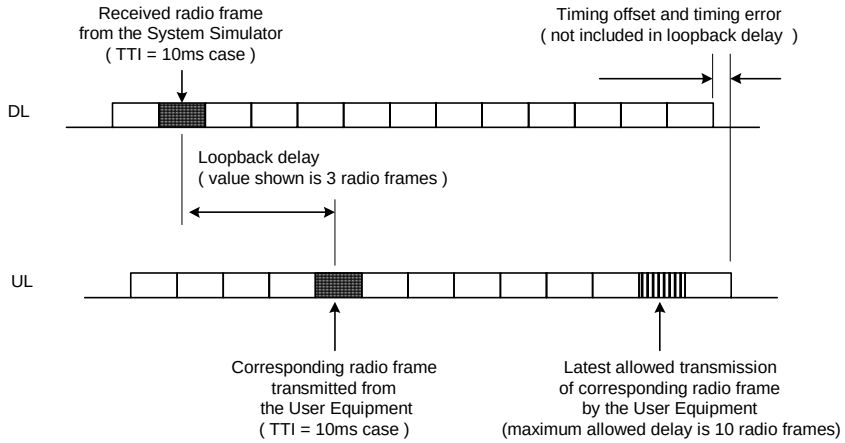

Figure 5.3.2.9.1: Loopback delay requirement (TTI=10 ms)

5.3.2.9.2 Loopback delay requirement for RLC and PDCP SDUs (UE Test loop mode 1)

The maximum delay from receiving an RLC or PDCP SDU in a downlink SAP until returning an SDU in the correspondent uplink SAP shall be within the delay requirement specified in subclause 5.3.2.9.1.

The UE test loop function, operating in UE test loop mode 1, shall for every ~~active~~ radio bearer with a closed test loop be able to return at least 4 SDUs within the time equal to the TTI of the actual radio bearer.

NOTE: To enable testing of the Conversational CS TM reference radio bearer combinations as specified in 34.108 subclause 6.10 a UE must be able to loop back 4 SDUs per TTI. E.g. for "Conversational / unknown / UL:64 DL:64 kbps / CS RAB" operated in TM RLC mode 4 SDUs are needed to fill the transport format existing of 4x640 bits.

NOTE: The loopback delay requirement in 5.3.2.9.2 does not impose any synchronisation mechanisms between the uplink RLC entity and the UE test loop function. Thus it could happen that a UE when having received 4 SDUs within one and the same TTI may deliver the SDUs to the uplink RLC entity in two subsequent TTIs. For a TM radio bearer requiring multiple SDUs to fill a transport block set then "Timer discard without explicit signalling" needs to be configured to secure that the TM RLC entity does not discard the SDUs in case they are delivered in subsequent TTIs.

5.3.3 Open UE test loop

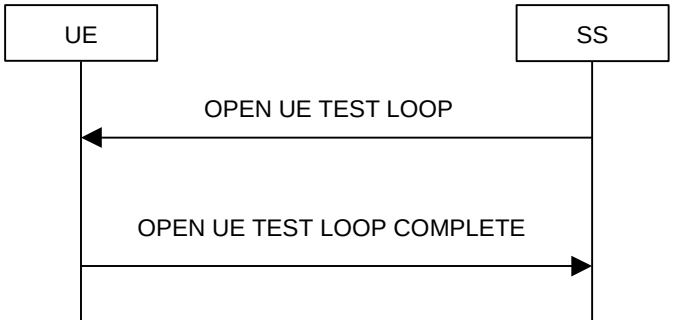

Figure 5.3.3.1: Open UE test loop procedure

5.3.3.1 General

The SS uses the procedure open UE test loop to deactivate the UE test loop function in the UE.

5.3.3.2 Initiation

The SS requests the UE to open ~~its~~ all closed radio bearer test loops by transmitting an OPEN_UE_TEST _LOOP_CMD message. The SS then starts timer TT01.

5.3.3.3 Reception of OPEN UE TEST LOOP message by the UE

If no bidirectional user plane radio bearers are ~~is~~ established, the UE shall ignore any OPEN UE TEST LOOP message.

If ~~a~~ one or more user plane radio bearer ~~is established~~ test loops are closed, the UE shall open ~~the~~ all test loops and send back to the SS an OPEN UE TEST LOOP COMPLETE message.

If the test loops are ~~is~~ already open, the UE shall still respond as if the loops had been closed, i.e. the OPEN UE TEST LOOP COMPLETE message should be sent prior to TT01 expiring.

5.3.3.4 Reception of OPEN UE TEST LOOP COMPLETE by the SS

Upon reception of the OPEN UE TEST LOOP COMPLETE message the SS stops timer TT01.

5.3.3.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

3GPP TSG-RAN WG2 Meeting #47
Athens, Greece, 9th - 13th May 2005

Tdoc ⌘ R2-051538

CR-Form-v7

CHANGE REQUEST

⌘ **34.109** **CR** **0036** ⌘ **rev** **-** ⌘ Current version: **6.0.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Clarification of loopback behaviour for uni-directional radio bearers
Source:	⌘	RAN WG2
Work item code:	⌘	HSDPA-L23
Date:	⌘	11/05/2005
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
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)*
Rel-6	*(Release 6)*

Reason for change: ⌘

1. The current specification does not define what should happen with user plane data that is received on a radio bearer before a loop is closed.
2. The current specification does not define how loopback should work for unidirectional user plane radio bearers such as used for the HS-PDSCH shared data channel for HSDPA.
3. The current specification does not define whether the loopback delay requirement applies if loopback type 1 is closed on both a transparent and unacknowledged mode radio bearer.
4. The current specification does not adequately describe UE behaviour when multiple user plane radio bearers are active.

Summary of change: ⌘

The text is modified to clarify that data shall be discarded if it is received on a user plane radio bearer that is not looped back.

The text is modified to clarify that loopback applies only when there is at least one bidirectional user plane radio bearer is configured and that unidirectional bearers are not looped back.

The text is modified to clarify that the loopback type 1 delay requirement applies to each user plane radio bearer that is configured for transparent RLC and MAC operation.

The text is modified to fully take account of multiple user plane radio bearers.

		The use of the term “user plane” to describe the radio bearer is standardised so as to emphasise that the loopback function does not apply to signalling radio bearers.
Consequences if not approved:	⌘	Testing of HSDPA and other services involving unidirectional user plane radio bearers would have to be done using configurations that do not match those defined in the core requirements against which the minimum performance has been specified. Such signals add confusion and complexity to the test setup which is neither essential nor desirable.

Clauses affected:	⌘	5.1, 5.2, 5.3			
Other specs Affected:	⌘	**Y** / **N**		⌘	
			Other core specifications		
		X /	Test specifications		34.121
		/ **X**	O&M Specifications		
Other comments:	⌘	This CR is applicable for Rel-5 and later releases.			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5 Test Control (TC) protocol procedures and test loop operation

5.1 General description

The UE test loop function provides access to isolated functions of the UE via the radio interface without introducing new physical interfaces just for the reason of conformance testing.

NOTE: It should be emphasised that the UE test loop function only describes the functional behaviour of the UE with respect to its external interfaces; physical implementation of the UE test loop function is completely left open to the manufacturer.

The UE test loop function is activated by transmitting the appropriate Test Control (TC) message to the UE, see clause 6.

For the purposes of this specification only, the following definitions are used:

Bidirectional Radio Bearer:

If the "RB mapping info" information element ([5] subclause 10.3.4.21) for the currently active configuration of a radio bearer includes mappings to both uplink and downlink transport channels then this radio bearer is defined to be a bidirectional radio bearer.

Unidirectional Radio Bearer:

If the "RB mapping info" information element ([5] subclause 10.3.4.21) for the currently active configuration of a radio bearer includes mappings to only uplink or downlink transport channels then this radio bearer is defined to be a unidirectional radio bearer.

NOTE: This definition of unidirectional radio bearer is only applicable to RLC Unacknowledged Mode, in this version of the specification.

The UE test loop function can be operated in two different loopback modes:

- UE test loop mode 1; and
- UE test loop mode 2.

Figure 5.1.1 shows a functional block diagram of UE test loop function for mode 1.

For UE test loop mode 1 the loopback point is located above Layer 2. Depending on the actual radio bearer setup loopback is performed of RLC SDUs or PDCP SDUs according to the procedure specified in subclause 5.3.3.2.

The loop back point for UE test loop mode 1 has been selected above Layer 2 to separate the protocol configurations from the UE test loop function. By configuration of RLC and MAC layers other loop back points may functional be achieved. E.g. by transparent configuration of RLC and MAC layer functional loop back point at Transport channel level can be achieved to implement the reference measurement channels as specified by TS 34.121 [8], Annex C for FDD and by TS 34.122 [9], Annex C for TDD.

For UE test loop mode 2 both data and CRC are looped back. UE test loop mode 2 is intended for Blind Transport Format Detection (BTFD) testing and BLER testing of DL 12.2 kbps reference measurement channel for which loopback of downlink CRC is required. UE test loop mode 2 can also be used for BLER testing of DL 64, 144 and 384 kbps reference measurement channels if the UE supports correspondent UL reference measurement channels. Both received data and CRC bits for the DCH transport channel used for the BTFD test case is returned according to the procedure specified in subclause 5.3.3.3.

A specific radio bearer test mode is specified to be used together with the UE test loop function. The purpose of the radio bearer test mode is to put the UE into a mode where: SS can set up radio bearers to be terminated in the UE test loop function without having to involve CC or SM; and to disable any control mechanisms in NAS protocols or in any UE applications that otherwise could cause the RRC connection to be released.

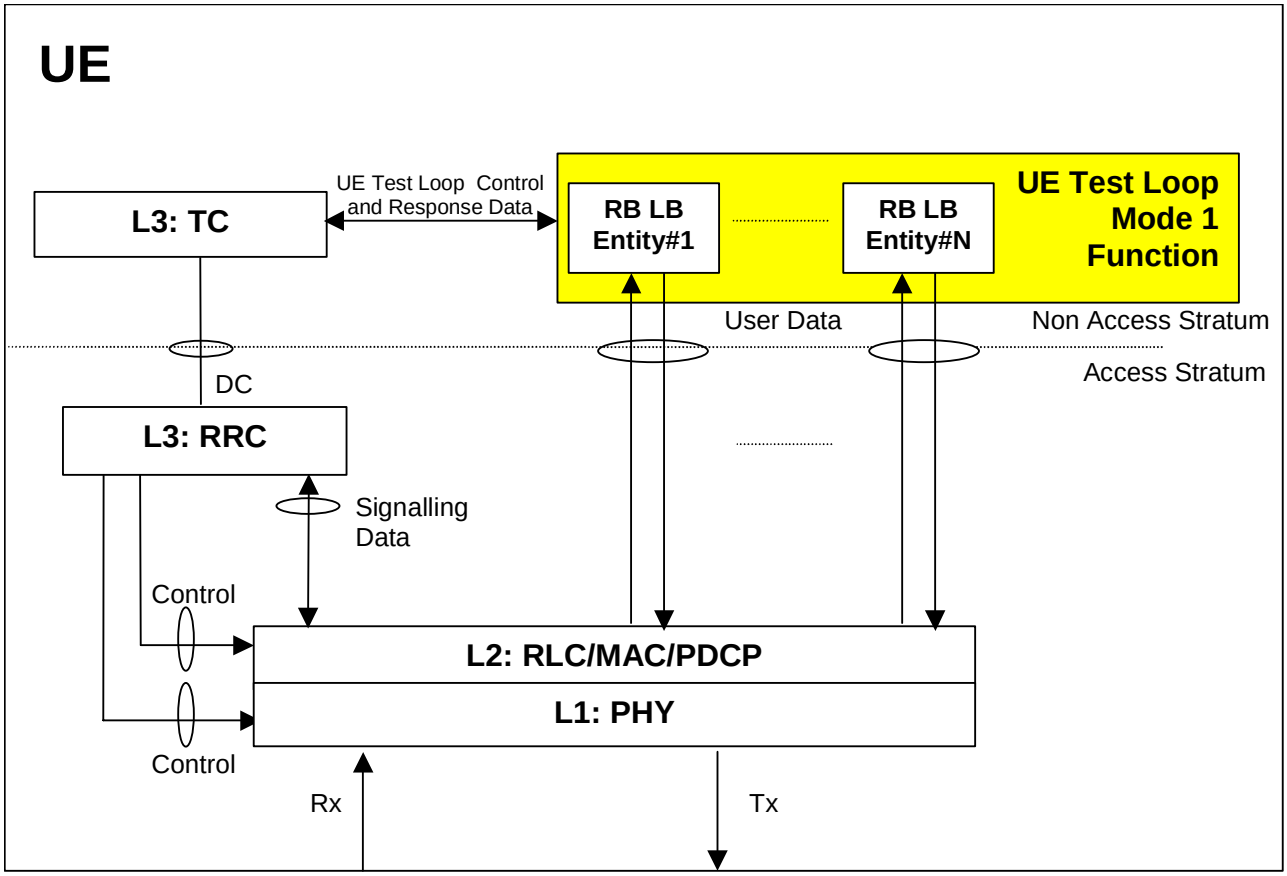

Figure 5.1.1: UE Test Loop Mode 1 function (TC =Test Control, LB = Loop Back entity)

5.2 UE radio bearer test mode procedures

5.2.1 Activate UE radio bearer test mode

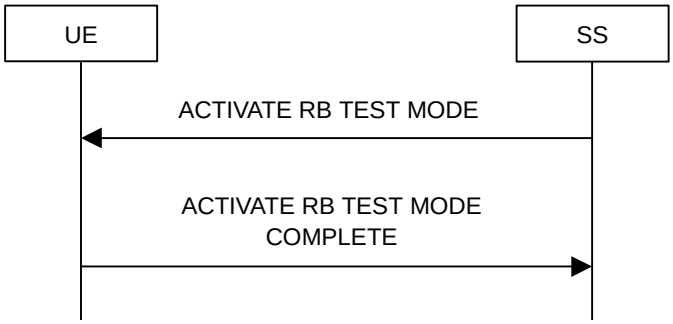

Figure 5.2.1.1: Activate UE radio bearer test mode procedure

5.2.1.1 General

The SS uses the activate UE radio bearer procedure to get the UE into a test mode where: the SS can set up radio bearers to be terminated in the UE test loop function without having to involve CC or SM; and to disable any control mechanisms in NAS protocols (TC protocol excluded) or in any UE applications that otherwise could cause the RRC connection to be released.

5.2.1.2 Initiation

The SS can initiate the UE radio bearer test mode when an RRC connection is established.

The SS requests the UE to activate the UE radio bearer test mode by transmitting an ACTIVATE RB TEST MODE message. The SS then starts timer TT01.

5.2.1.3 Reception of ACTIVATE RB TEST MODE message by UE

When the UE receives the ACTIVATE RB TEST MODE message then the radio bearer test mode shall be activated.

When the radio bearer test mode is active the UE shall:

- accept any requested radio bearer setup within the radio access capabilities of the UE;
- terminate all user plane radio bearer(s) in the UE test loop function; and
- discard all SDUs delivered by the RLC layer to the UE test loop function for a radio bearer without a closed test loop if the configuration of that radio bearer does not include the PDCP layer; and
- discard all SDUs delivered by the PDCP layer to the UE test loop function for a radio bearer without a closed test loop if the configuration of that radio bearer includes the PDCP layer (configured by "PDCP info" (see [5]); and
- disable any control mechanisms in NAS protocols or in any UE applications that otherwise could cause the RRC connection to be released.

When the radio bearer test mode has been activated the UE shall transmit the ACTIVATE RB TEST MODE COMPLETE message.

NOTE: When the radio bearer test mode is active the UE does not need to provide any CC or SM functionality.

5.2.1.4 Reception of ACTIVATE RB TEST MODE COMPLETE message by SS

Upon reception of the ACTIVATE RB TEST MODE COMPLETE message the SS stops timer TT01.

The reception of the ACTIVATE RB TEST MODE COMPLETE message by SS confirms that the UE radio bearer test mode has been activated in the UE.

5.2.1.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

5.2.2 Deactivate UE radio bearer test mode

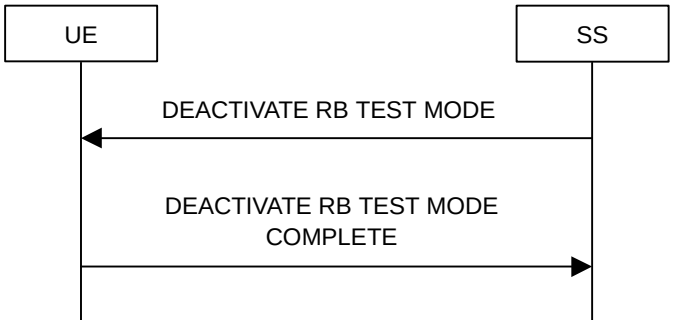

Figure 5.2.2.1: Deactivate UE radio bearer test mode procedure

5.2.2.1 General

The purpose of this procedure is to deactivate the radio bearer test mode and return UE to normal operation.

5.2.2.2 Initiation

The SS can deactivate the UE radio bearer test mode when an RRC connection is established and the UE radio bearer test mode is active.

The SS requests the UE to deactivate the UE radio bearer test mode by transmitting a DEACTIVATE RB TEST MODE message. The SS then starts timer TT01.

5.2.2.3 Reception of DEACTIVATE RB TEST MODE message by UE

When the UE receives DEACTIVATE RB TEST MODE message then the radio bearer test mode shall be deactivated and UE shall be returned to normal operation.

When the UE has deactivated the radio bearer test mode the UE shall transmit the DEACTIVATE RB TEST MODE COMPLETE message using the RRC UPLINK DIRECT TRANSFER message.

5.2.2.4 Reception of DEACTIVATE RB TEST MODE COMPLETE message by SS

Upon reception of the DEACTIVATE RB TEST MODE COMPLETE message the SS stops timer TT01.

The reception of DEACTIVATE RB TEST MODE COMPLETE message by SS confirms that the UE radio bearer test mode has been deactivated in the UE.

5.2.2.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

5.3 UE test loop procedures

5.3.1 General

The UE test loop function is intended for:

- Testing of receiver characteristics based on BER (Bit Error Ratio) measurement. The SS calculates BER from a bit-by-bit comparison of data sent to and received from UE. BER measurement requires symmetric RAB bit-rates.
- Testing of receiver performance based on BLER (BLock Error Ratio) measurement. The SS calculates BLER based on the RLC STATUS SDU received from the UE operating in RLC acknowledged mode; or the SS calculates BLER based on checking returned downlink data and downlink CRC by UE operating in UE test loop mode 2.
- Testing of UE Blind Transport Format Detection.
- Testing of UE transmitter characteristics.
- Testing of UE transmitter DTX characteristics.
- Testing of radio bearers (UE test loop function emulates terminal equipment).

5.3.2 Close UE test loop

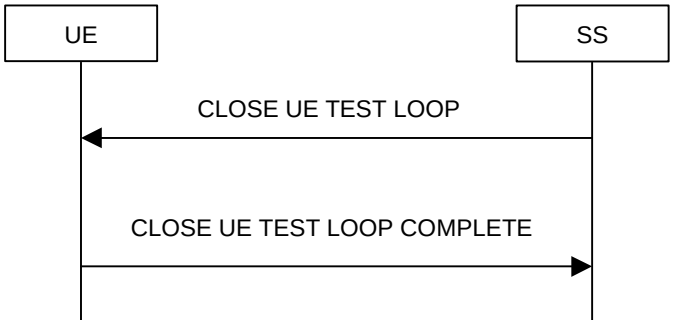

Figure 5.3.2.1: Close UE test loop procedure

5.3.2.1 General

The SS uses the close UE test loop procedure to start the UE Test Loop function in the UE. A prerequisite is that at least one bidirectional user plane radio bearer has been established between SS and UE. See TS 34.108 [10], clause 7 for generic setup procedures.

The UE shall provide for normal Uu layer 1, layer 2 and RRC functionality while the UE test loop function is active. This includes (but is not limited to) handover procedures and normal disconnection of the radio bearer. The loopback shall be maintained across handovers, but after radio bearer disconnection, the loopback shall cease to exist.

5.3.2.2 Initiation

The SS can request the UE to close a test loop if at least one bidirectional user plane radio bearer is established and the UE radio bearer test mode is active.

The SS requests the UE to close its radio bearer test loop by transmitting a CLOSE UE TEST LOOP message. The SS then starts timer TT01.

5.3.2.3 Reception of CLOSE UE TEST LOOP message by the UE

If no user plane bidirectional radio bearers are ~~is~~ established or the UE radio bearer test mode is not active, then the UE shall ignore any CLOSE UE TEST LOOP message.

If ~~a~~ one or more user plane bidirectional radio bearers are ~~is~~ established, the UE shall close the test loop on all user plane bidirectional radio bearers and then send back to the SS a CLOSE UE TEST LOOP COMPLETE message. The loopback shall be operational prior to the sending of the acknowledgement. The UE shall not close the test loop on any unidirectional user plane radio bearers.

If the test loop is already closed on one or more user plane radio bearers, the UE shall still respond as if the loop had been open, i.e. the CLOSE UE TEST LOOP COMPLETE message shall be sent.

NOTE: There is no requirement on the UE to read the content of the CLOSE UE TEST LOOP message if it is received while the test loop is closed.

If UE test loop mode 1 has been selected then the loop back scheme according to subclause 5.3.2.6 shall be performed by the UE.

If UE test loop mode 2 has been selected then the loop back scheme according to subclause 5.3.2.7 shall be performed by the UE.

5.3.2.4 Reception of CLOSE UE TEST LOOP COMPLETE message by the SS

Upon reception of the CLOSE UE TEST LOOP COMPLETE message the SS stops timer TT01.

5.3.2.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.

5.3.2.6 UE test loop mode 1 operation

If the configuration of a user plane radio bearer with a closed UE test loop mode 1 includes the PDCP protocol layer, configured by "PDCP info" (see ~~TS 25.331~~ [5]), then the loop back scheme according to subclause 5.3.2.6.1 shall be performed by the UE for that~~e actual~~ radio bearer.

If the PDCP protocol layer is not used for a user plane radio bearer with a closed UE test loop mode 1 then the loop back scheme according to subclause 5.3.2.6.2 shall be performed by the UE for that~~e actual~~ radio bearer.

5.3.2.6.1 Loopback of PDCP SDUs

If UE test loop mode 1 has~~ve~~ been ~~selected~~ closed on a user plane radio bearer and the setup of that radio bearer ~~setup~~ includes configuration of PDCP protocol layer, configured by "PDCP info" (see ~~TS 25.331~~ [5]), then the following loop back scheme shall be performed by the UE.

After the UE has closed ~~its radio bearer~~ UE test loop mode 1 on a user plane radio bearer, every PDCP SDU received by the UE on that~~e active~~ radio bearer (downlink) shall be taken from the output of the PDCP service access point (SAP) and be input to the correspondent PDCP SAP and transmitted (uplink).

The UE shall provide for normal PDCP operation.

The PDCP loopback operation is illustrated in figure 5.3.2.6.1.1.

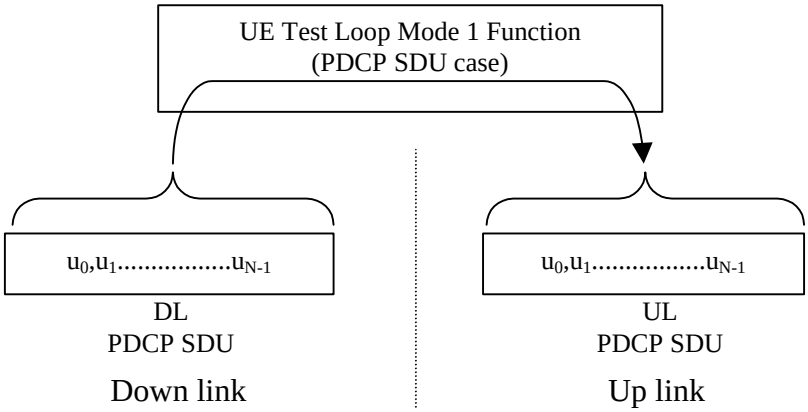

Figure 5.3.2.6.1.1: Loop back of PDCP SDU
(DL RLC SDU size = UL RLC SDU size = N)

5.3.2.6.2 Loopback of RLC SDUs

If UE test loop mode 1 has been ~~selected~~ closed on a user plane radio bearer and the setup of that radio bearer ~~setup~~ does not include configuration of the PDCP protocol layer ("PDCP info" is not configured~~. S~~(see ~~TS 25.331~~ [5]) then the following loop back scheme shall be performed by the UE.

After the UE has closed ~~its radio bearer~~ UE test loop mode 1 on a user plane radio bearer, every user data block received by the UE on that~~e active~~ radio bearer (downlink) shall be taken from the output of the RLC service access point (SAP) and be input to the correspondent RLC SAP and transmitted (uplink). The UE reads the UL RLC SDU size parameter from the "LB Setup RB IE#k" parameter associated with that~~e~~ radio bearer, see subclause 6.2.

If no "LB Setup RB IE#k" parameter is associated with that~~e~~ radio bearer then the UE shall use the same UL RLC SDU size as the received DL RLC SDU.

For the case when the "UL RLC SDU size" parameter is set to "0" no data shall be returned.

For the case when the "UL RLC SDU size" parameter is set to the same value as the down link (DL) RLC SDU block size then the complete user data block shall be returned, see figure 5.3.2.6.2.1.

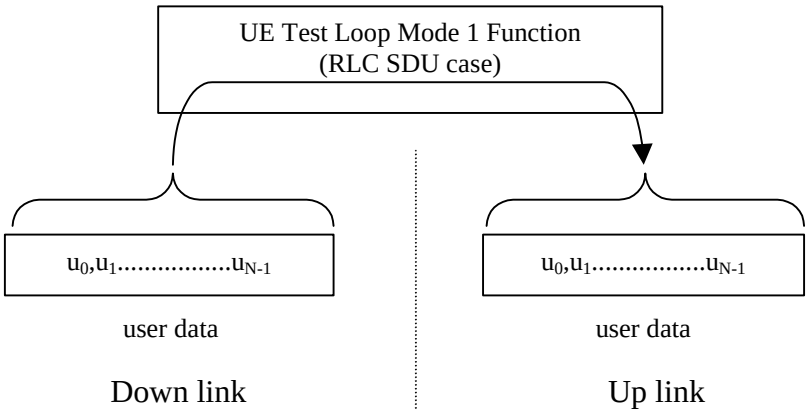

Figure 5.3.2.6.2.1: DL and UL RLC SDU block size equal (DL RLC SDU size = UL RLC SDU size = N)

For the case when the "UL RLC SDU size" parameter is set to a value less than the down link (DL) RLC SDU block size then the UE shall return the first K bits of the received block, where K is the UL block size, see figure 5.3.2.6.2.2.

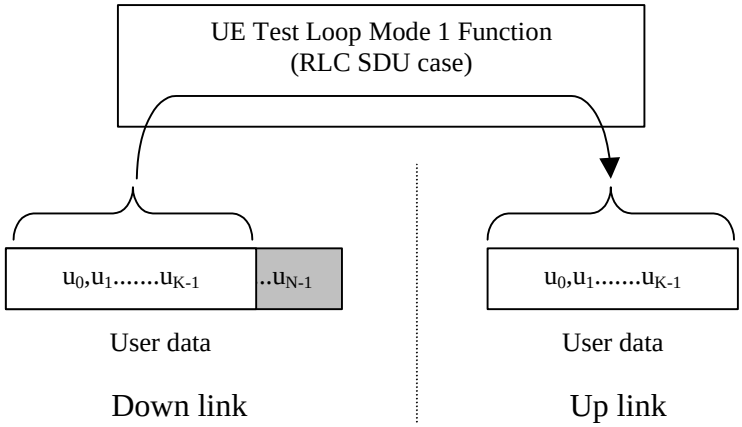

Figure 5.3.2.6.2.2: DL > UL RLC SDU block size (DL RLC SDU size = N, UL RLC SDU size = K)

For the case when the "UL RLC SDU size" parameter is set to a value bigger than the down link (DL) RLC SDU block size then the UE shall pad the UL send block by repeating the received data block until the UL send block has been filled (truncating the last block if necessary), see figure 5.3.2.6.2.3.

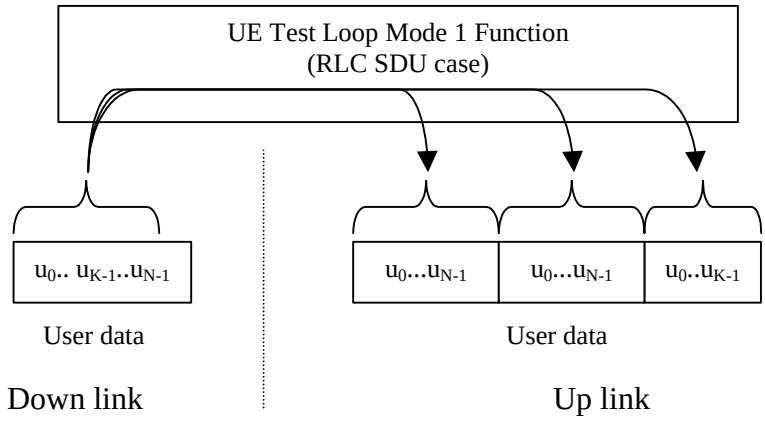

Figure 5.3.2.6.2.3: DL < UL RLC SDU block size (DL RLC SDU size = N, UL RLC SDU size = 2*N + K)

5.3.2.7 UE test loop mode 2 operation

For UE test loop mode 2 to work correctly ciphering shall be disabled.

For the UE to be able to return downlink transport block data and CRC bits then the up link transport channel configuration shall include a transport format for which the block size is equal to or bigger than the sum of the downlink transport block size and the number of downlink CRC bits. If no such uplink transport format exists then the returned data and CRC bits will be truncated.

5.3.2.7.1 Loopback of downlink transport block data and downlink CRC

If UE test loop mode 2 has been ~~selected~~ closed on a user plane radio bearer then the following loop back scheme shall be performed by the UE for all transport channels associated with a single DTCH:

After the UE has closed ~~the~~ test loop mode 2 on a user plane radio bearer then the UE shall copy the ~~received~~ downlink transport block and CRC bits received on that radio bearer to the up-link transport block and transmit in the up-link transport channel configured for that radio bearer.

If the uplink ~~radio bearer~~ configuration for that radio bearer is of variable rate then the transport format with the smallest transport block size which fits the downlink transport block size and the downlink CRC bits shall be selected ~~in~~ for the uplink. In case there is no uplink transport format that fits the downlink transport block data and the downlink CRC bits then the data and CRC bits shall be truncated using the transport format with the biggest transport block size configured for that uplink transport channel.

UE test loop mode 2 operation is illustrated for the case when the uplink transport block size is bigger than the sum of the downlink transport block size and size of downlink CRC in figure 5.3.2.7.1.

UE test mode 2 operation is illustrated for the case when uplink transport block size is smaller than the sum of downlink transport block size and size of downlink CRC in figure 5.3.2.7.2.

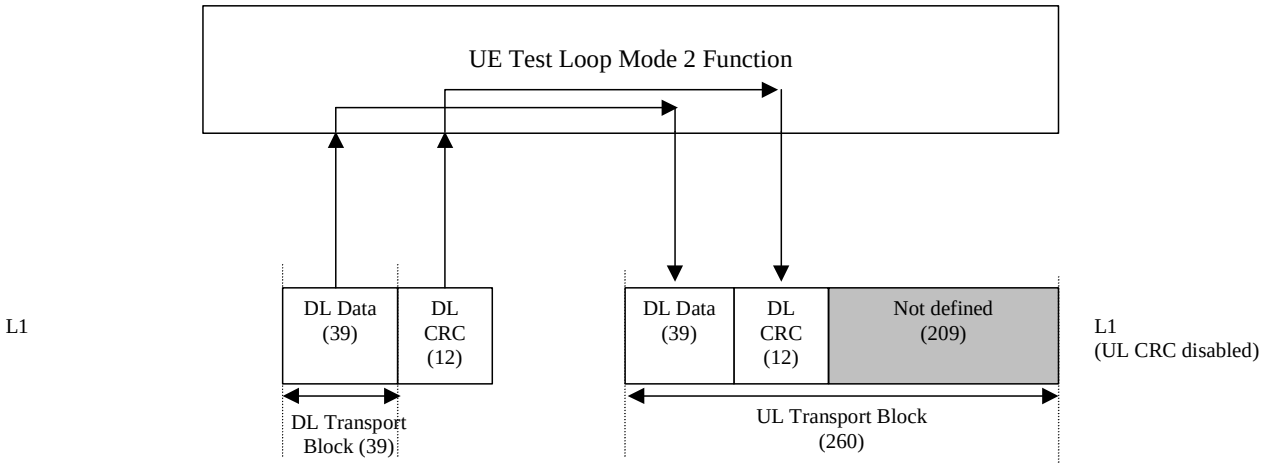

Figure 5.3.2.7.1. UE test loop mode 2 operation for the case when uplink transport block size is bigger than the sum of downlink transport block size and size of downlink CRC

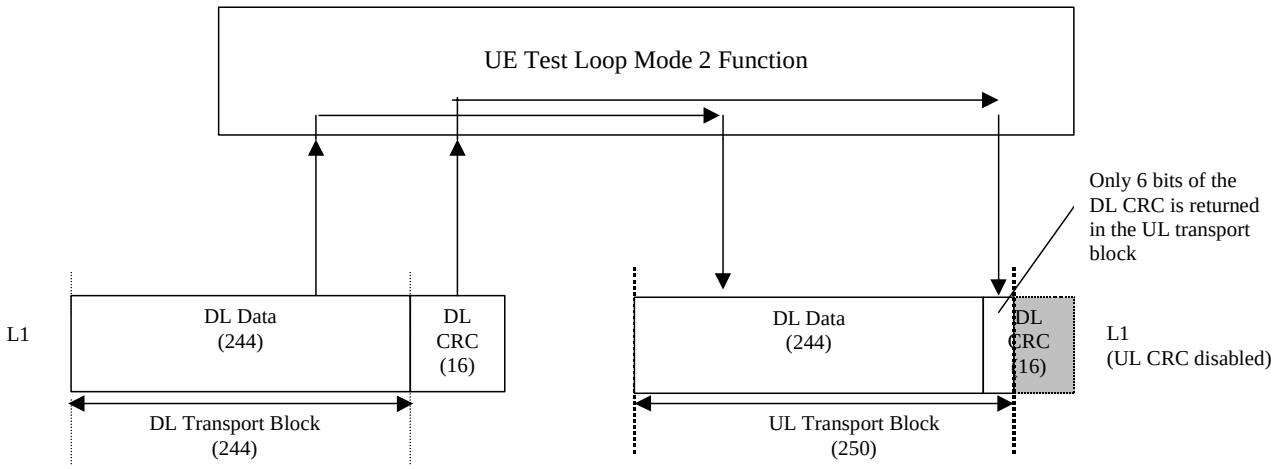

Figure 5.3.2.7.2. UE test loop mode 2 operation for the case when uplink transport block does not fit downlink transport block and downlink CRC bits.

5.3.2.8 Void

5.3.2.9 Loopback delay requirement

5.3.2.9.1 General loopback delay requirement

Loopback delay is specified as delay between received DL radio frames and their corresponding UL radio frames produced from the received data. The loopback delay is measured at the antenna connector of the UE and specified in the unit of radio frame(s). Timing offset between DL and UL radio frames, and timing errors are not included in the loopback delay.

For UE operating in UE test loop mode 1 the loopback delay requirement is applicable for a radio bearer with a closed test loop if the MAC and RLC protocols for that radio bearer are configured for transparent operation and if the downlink RLC SDU size is equal to the downlink transport block size, i.e. no segmentation/concatenation takes place.

For UE operating in UE test loop mode 2 the loopback delay requirement is applicable ~~independent of the~~ for any radio bearer configuration.

~~While the UE test loop is closed and the radio bearer configuration is not changed, t~~The UE shall maintain a fixed loopback delay (the loopback delay shall not vary during a test) if the configuration of radio bearers with closed test loops remains unchanged. The loopback delay shall not exceed the number of radio frames correspondent to 10 times the TTI of the actual transport channel configuration.

The loopback delay requirement for the 10ms TTI case is illustrated in figure 5.3.2.9.1.

NOTE 1: See TS 25.211 [11], subclause 7.6.3 for definition of the timing offset between DL and UL radio frames for FDD mode.

NOTE 2: See TS 25.133 [12], subclause 7.1 for definition of the timing error for FDD mode.

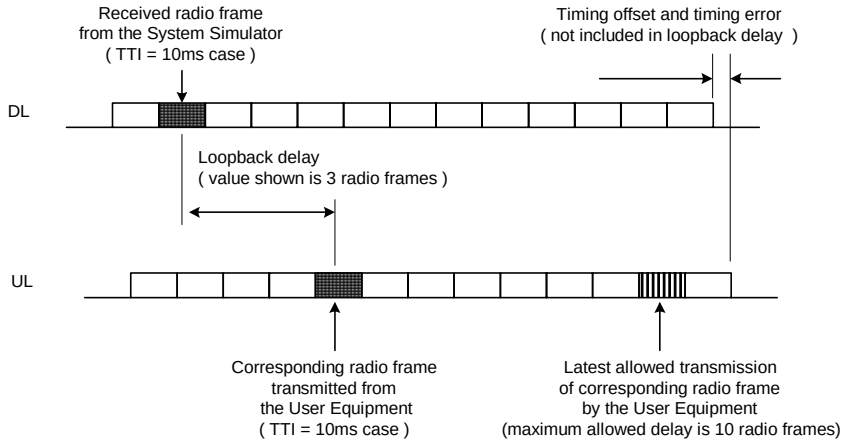

Figure 5.3.2.9.1: Loopback delay requirement (TTI=10 ms)

5.3.2.9.2 Loopback delay requirement for RLC and PDCP SDUs (UE Test loop mode 1)

The maximum delay from receiving an RLC or PDCP SDU in a downlink SAP until returning an SDU in the correspondent uplink SAP shall be within the delay requirement specified in subclause 5.3.2.9.1.

The UE test loop function, operating in UE test loop mode 1, shall for every ~~active~~ radio bearer with a closed test loop be able to return at least 4 SDUs within the time equal to the TTI of the actual radio bearer.

NOTE: To enable testing of the Conversational CS TM reference radio bearer combinations as specified in 34.108 subclause 6.10 a UE must be able to loop back 4 SDUs per TTI. E.g. for "Conversational / unknown / UL:64 DL:64 kbps / CS RAB" operated in TM RLC mode 4 SDUs are needed to fill the transport format existing of 4x640 bits.

NOTE: The loopback delay requirement in 5.3.2.9.2 does not impose any synchronisation mechanisms between the uplink RLC entity and the UE test loop function. Thus it could happen that a UE when having received 4 SDUs within one and the same TTI may deliver the SDUs to the uplink RLC entity in two subsequent TTIs. For a TM radio bearer requiring multiple SDUs to fill a transport block set then "Timer discard without explicit signalling" needs to be configured to secure that the TM RLC entity does not discard the SDUs in case they are delivered in subsequent TTIs.

5.3.3 Open UE test loop

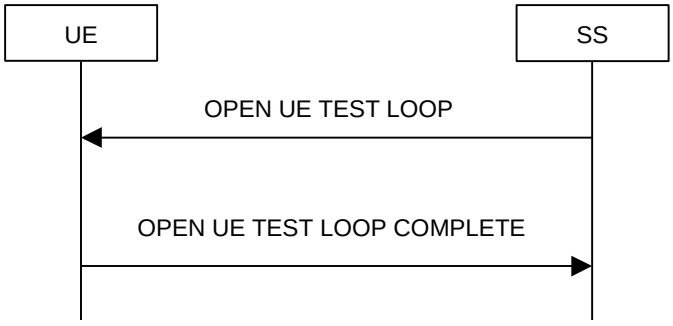

Figure 5.3.3.1: Open UE test loop procedure

5.3.3.1 General

The SS uses the procedure open UE test loop to deactivate the UE test loop function in the UE.

5.3.3.2 Initiation

The SS requests the UE to open ~~its~~ all closed radio bearer test loops by transmitting an OPEN_UE_TEST _LOOP_CMD message. The SS then starts timer TT01.

5.3.3.3 Reception of OPEN UE TEST LOOP message by the UE

If no bidirectional user plane radio bearers are ~~is~~ established, the UE shall ignore any OPEN UE TEST LOOP message.

If ~~a~~ one or more user plane radio bearer ~~is established~~ test loops are closed, the UE shall open ~~the~~ all test loops and send back to the SS an OPEN UE TEST LOOP COMPLETE message.

If the test loops are ~~is~~ already open, the UE shall still respond as if the loops had been closed, i.e. the OPEN UE TEST LOOP COMPLETE message should be sent prior to TT01 expiring.

5.3.3.4 Reception of OPEN UE TEST LOOP COMPLETE by the SS

Upon reception of the OPEN UE TEST LOOP COMPLETE message the SS stops timer TT01.

5.3.3.5 TT01 timeout

If TT01 expires, then the SS shall indicate this to the test case. The procedure is then completed.