

**TSG-RAN Meeting #15**  
**Jeju-do, Korea, 5 - 8 March 2002**

**RP-020077**

**Title:** Agreed CRs (Release '99 and Rel-4 category A) to TS 34.109

**Source:** TSG-RAN WG2

**Agenda item:** 7.2.3

Doc-1st-	Status-	Spec	CR	Rev	Phase	Subject	Cat	Version	Versio
R2-020398	agreed	34.109	011		R99	Clarifications of UE conformance test functions	F	3.4.0	3.5.0
R2-020399	agreed	34.109	012		Rel-4	Clarifications of UE conformance test functions	A	4.1.0	4.2.0

CR-Form-v4

## CHANGE REQUEST

⌘ **34.109 CR 011** ⌘ ev **-** ⌘ Current version: **3.4.0** ⌘

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

<b>Title:</b>	⌘ Clarifications of UE conformance test functions		
<b>Source:</b>	⌘ TSG-RAN WG2		
<b>Work item code:</b>	⌘ TEI <span style="float: right;"><b>Date:</b> ⌘ 2002-02-18</span>		
<b>Category:</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;">                 ⌘ <b>F</b>                  Use <u>one</u> of the following categories:  <b>F</b> (correction)  <b>A</b> (corresponds to a correction in an earlier release)  <b>B</b> (addition of feature),  <b>C</b> (functional modification of feature)  <b>D</b> (editorial modification)                  Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a>.             </td> <td style="width: 50%; vertical-align: top;"> <b>Release:</b> ⌘ <b>R99</b>                  Use <u>one</u> 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)             </td> </tr> </table>	⌘ <b>F</b> Use <u>one</u> of the following categories: <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .	<b>Release:</b> ⌘ <b>R99</b> Use <u>one</u> 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)
⌘ <b>F</b> Use <u>one</u> of the following categories: <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .	<b>Release:</b> ⌘ <b>R99</b> Use <u>one</u> 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)		

<b>Reason for change:</b> ⌘	<ol style="list-style-type: none"> <li>1. Clarification of UE behaviour when radio bearer test mode active.</li> <li>2. Clarification of UE behaviour when CLOSE UE TEST LOOP message is received by the UE.</li> <li>3. Clarification of applicability of DCCH dummy message functionality.</li> <li>4. Editorial corrections</li> </ol>
<b>Summary of change:</b> ⌘	<ol style="list-style-type: none"> <li>1. Following changes have been introduced to clarify UE behaviour when radio bearer test mode is active:                     <ol style="list-style-type: none"> <li>a. Clause 5.2.1.3, added sentence to clarify UE behaviour regarding CC and SM when radio bearer test mode is activated</li> <li>b. Clause 4.3, 5.3.2.2 and 5.3.2.3 modified to clarify that SS can only request closing of UE test loops when the UE radio bearer test mode is active.</li> </ol> </li> <li>2. Added sentence in clause 5.3.2.3 to clarify UE behaviour when receiving CLOSE UE TEST LOOP message when UE test loop already is closed.</li> <li>3. Clause 5.3.2.8, modified prerequisite to clarify that DCCH dummy transmission is only applicable for uplink radio bearer configurations having a DCCH mapped to a DCH.</li> <li>4. Editorial corrections.                     <ol style="list-style-type: none"> <li>a. Figure 5.1.1, "Control" changed to "Signalling Data".</li> <li>b. Figures 5.3.2.6.1.1, 5.3.2.6.2.1, 5.3.2.6.2.2 and 5.3.2.6.2.3 changed to be consistent with the text regarding the numbering of bits and the SDU size.</li> <li>c. Clause 5.3.2.1, changed "RAB" to "radio bearer"</li> </ol> </li> </ol>

<b>Consequences if not approved:</b>	⌘	
<b>Clauses affected:</b>	⌘	4.3, 5.1, 5.2.1.3, 5.3.2.1, 5.3.2.2, 5.3.2.3, 5.3.2.6.1, 5.3.2.6.2, 5.3.2.8
<b>Other specs Affected:</b>	⌘	<input type="checkbox"/> Other core specifications      ⌘ 34.109 v4.1.0, CR 012 <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘	

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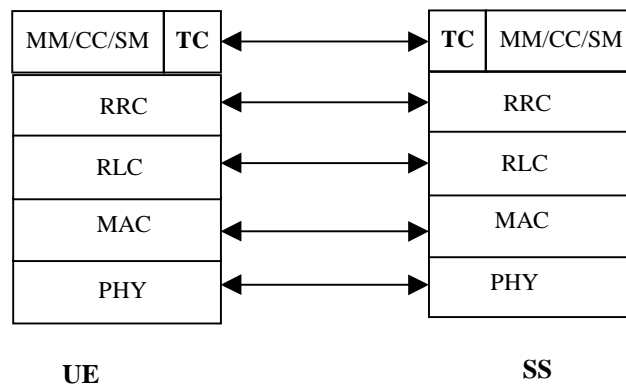
- 1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
- 2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") 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.

## 4 UE conformance test functions

### 4.1 General description

The SS performs activation and deactivation of the conformance test functions in the UE by sending standard NAS Layer 3 messages. A specific protocol discriminator value has been defined in [1] TS 24.007, 11.2.3.1.1 for the UE test command messages. Figure 4.1.1 illustrates the Layer 3 protocol entity Test Control (TC) where the UE test command messages terminates.

NOTE: The protocol discriminator value used for the TC messages is the same as used in GSM for the MS specific testing functions, see [13] GSM 04.14.



**Figure 4.1.1: TC protocol termination (TC =Test Control).**

Apart from sending the appropriate deactivation command to the UE the functions shall be deactivated by switching off the UE.

The following UE conformance testing functions can be activated (and deactivated):

- UE test loop function;
- UE radio bearer test mode
- Electrical Man Machine Interface (EMMI)

In addition to the conformance testing functions listed above there is a set of reference measurement channels that an UE need to support to enable RF conformance testing. The reference measurement channels are defined in [3] TS 25.101, Annex A for FDD and in [4] TS 25.102, Annex A for TDD.

Example of reference measurement channels (RMC) essential to all UEs supporting FDD or TDD are:

- UL 12.2kbps RMC (Reference Measurement Channel)
- DL 12.2kbps RMC

Example of reference measurement channels associated with UE service capabilities for FDD (DL and UL) and TDD (DL only) are:

- DL 64kbps RMC
- DL 144kbps RMC
- DL 384kbps RMC
- UL 64kbps RMC
- UL 144kbps RMC
- UL 384kbps RMC

## 4.2 UE radio bearer test mode

The UE radio bearer test mode is specified in clause 5.2.

The following TC procedures are used to control the UE radio bearer test mode:

- Activate UE radio bearer test mode
- Deactivate UE radio bearer test mode

## 4.3 UE test loop

The UE test loop function is specified in clause 5.3.

The following TC procedures are used to control the UE test loop function:

- Close UE test loop
- Open UE test loop

[A prerequisite for the UE test loop function is that the UE radio bearer test mode is active.](#)

## 4.4 EMMI

The EMMI is specified in clause 7.

No specific TC procedures are associated with EMMI.

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# 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 1: 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.

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 clause 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 [3] TS 25.101, Annex A for FDD and by [4] TS 25.102, Annex A 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 clause 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.

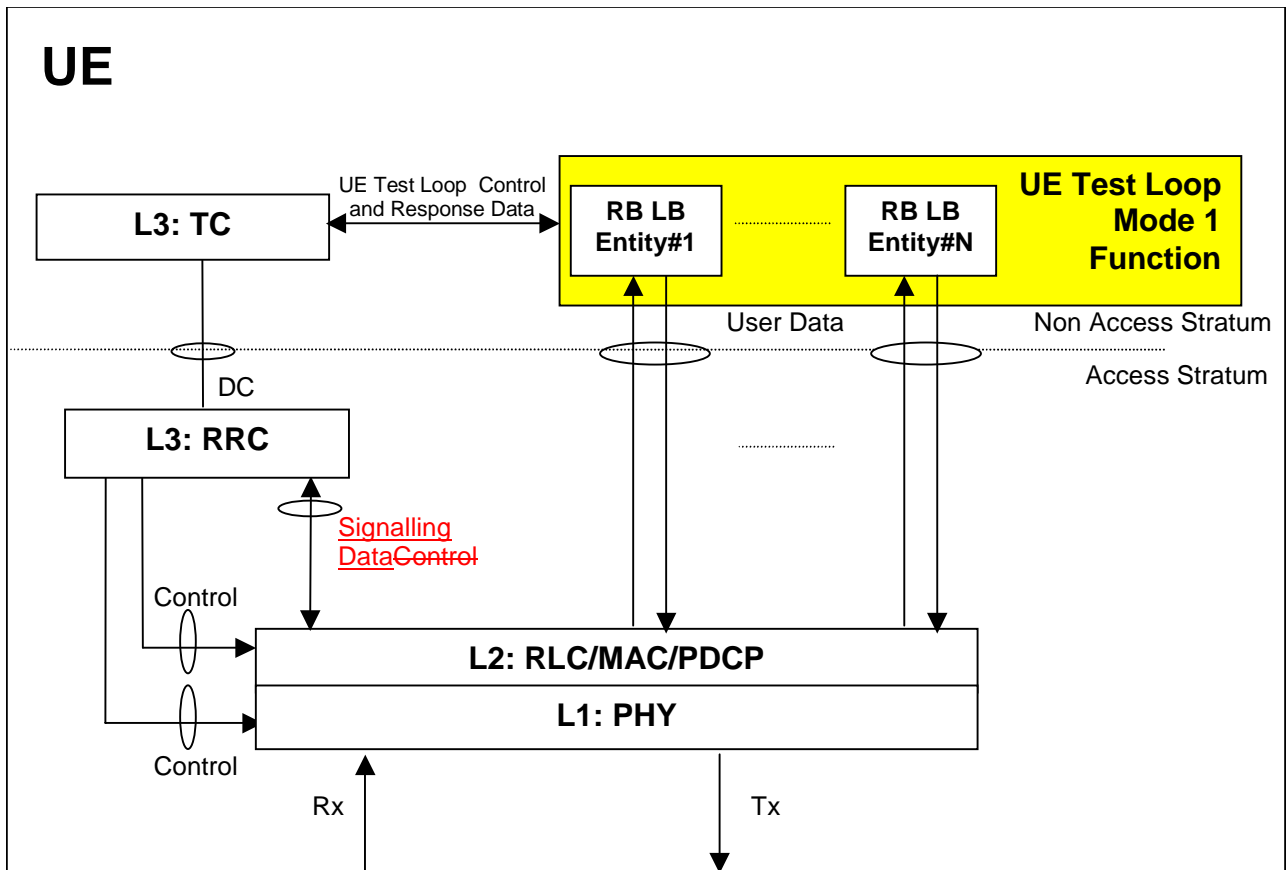


Figure 5.1.1: UE Test Loop Mode 1 function (TC =Test Control, LB = Loop Back entity)

## 5.2 UE radio bearer test mode procedures

### 5.2.1 Activate UE radio bearer test mode

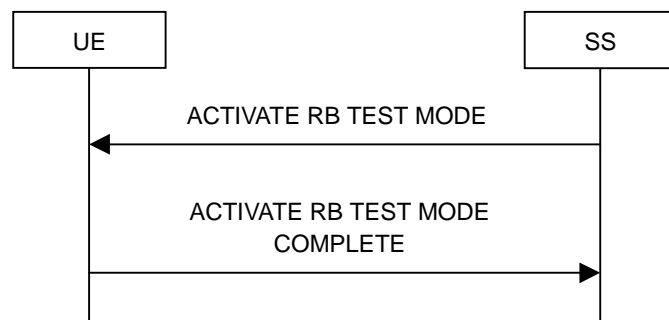


Figure 5.2.1.1: Activate UE radio bearer test mode procedure

### 5.2.1.1 General

The SS uses the activate UE radio bearer procedure to get UE into a test 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 (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 UE receives 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
- 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

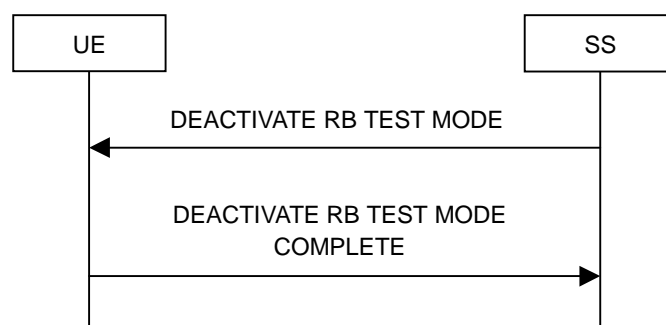


Figure 5.2.2.1: Deactivate UE radio bearer test mode procedure

### 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

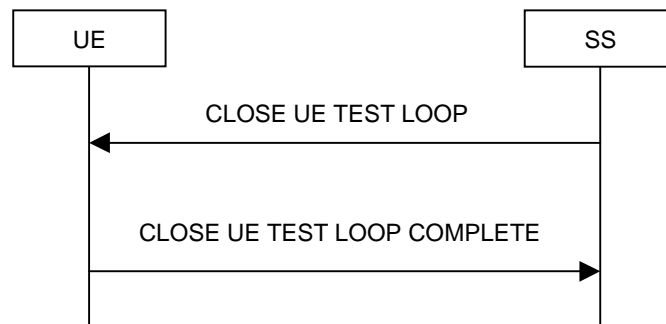


Figure 5.3.2.1: Close UE test loop procedure

#### 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 a [radio bearer](#) ~~RAB~~ has been established between SS and UE. See [10] TS 34.108, 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](#) ~~RAB~~ disconnection, the loopback shall cease to exist.

#### 5.3.2.2 Initiation

[The SS can request UE to close a test loop if a 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 radio bearer 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 radio bearer is established, the UE shall close the test loop and then send back to the SS a CLOSE UE TEST LOOP COMPLETE message. The loopback shall ~~be~~ be operational prior to the sending of the acknowledgement.

If the test loop is already closed, the UE shall still respond as if the loop had been open, i.e. the CLOSE UE TEST LOOP COMPLETE message shall ~~be~~ 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 mode 1 has been selected then the loop back scheme according to 5.3.2.6 shall be performed by the UE.

If UE test mode 2 has been selected then the loop back scheme according to 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 radio bearer includes the PDCP protocol layer then the loop back scheme according to 5.3.2.6.1 shall be performed by the UE for the actual radio bearer.

If the PDCP protocol layer is not used for a radio bearer then the loop back scheme according to 5.3.2.6.2 shall be performed by the UE for the actual radio bearer.

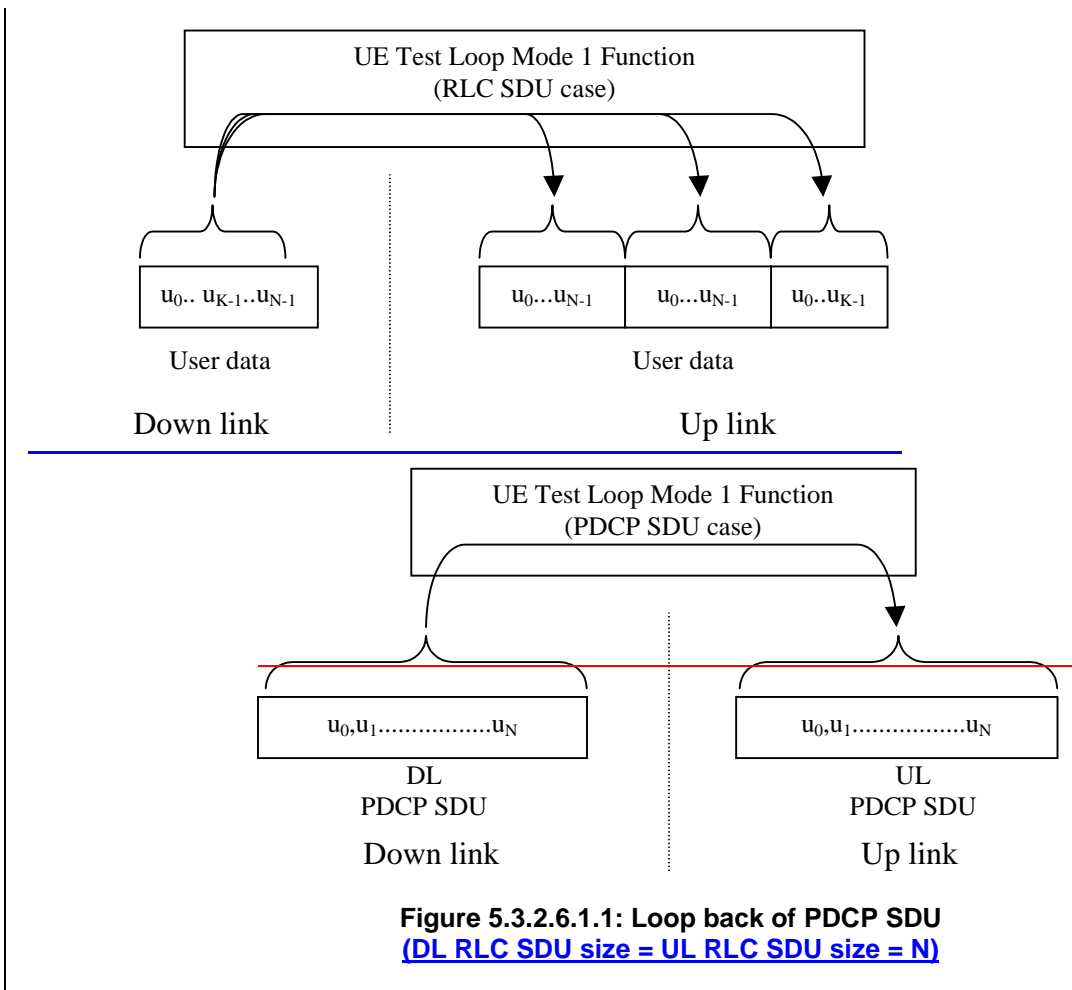
### 5.3.2.6.1 Loopback of PDCP SDUs

If UE test mode 1 have been selected and the radio bearer setup includes configuration of PDCP protocol layer then the following loop back scheme shall be performed by the UE:

After the UE has closed its radio bearer test loop, every PDCP SDU received by the UE on the 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

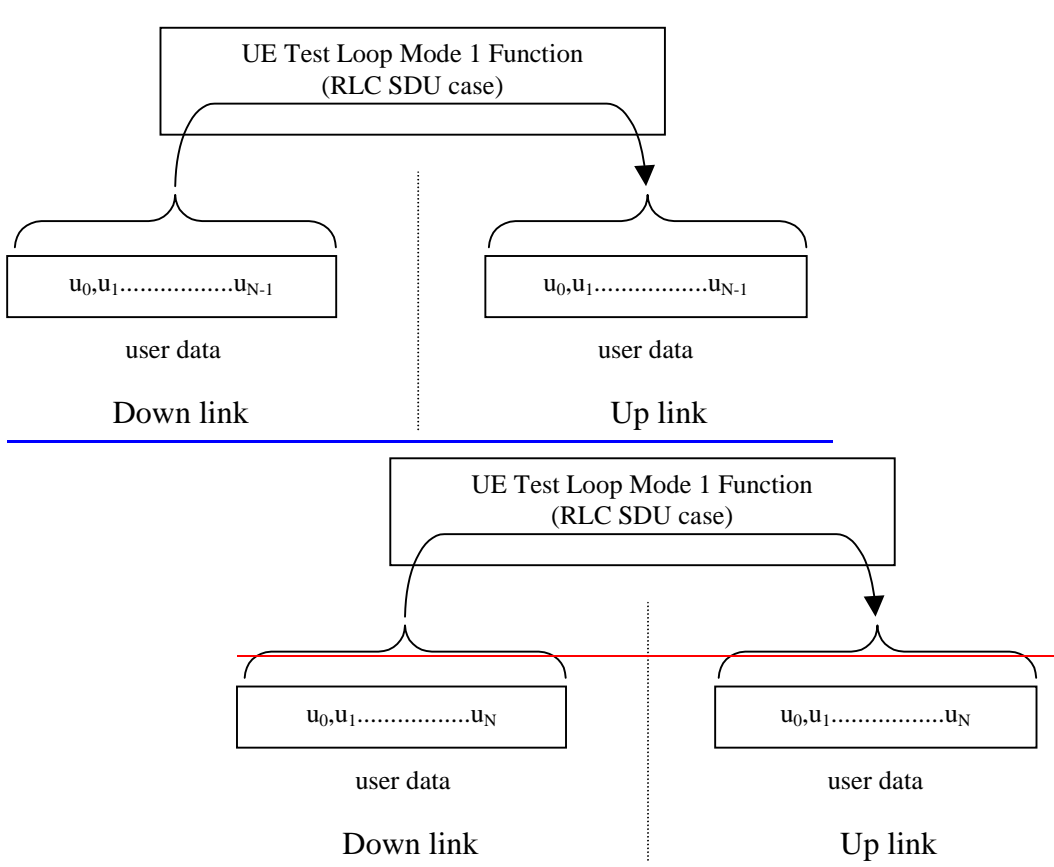
If UE test mode 1 has been selected and radio bearer setup does not include configuration of PDCP protocol layer then the following loop back scheme shall be performed by the UE:

After the UE has closed its radio bearer test loop, every user data block received by the UE on the 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 the radio bearer, see 6.2.

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

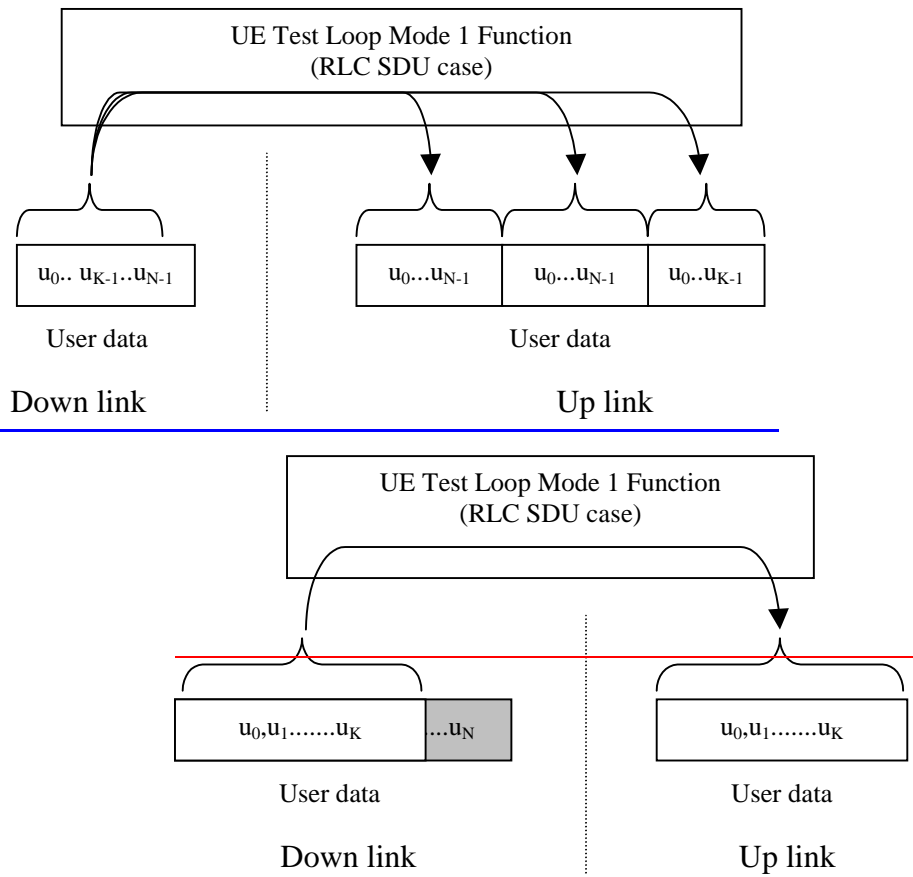
For the case when the "UL RLC SDU size" parameter is set to "0" no data shall be returned.

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.



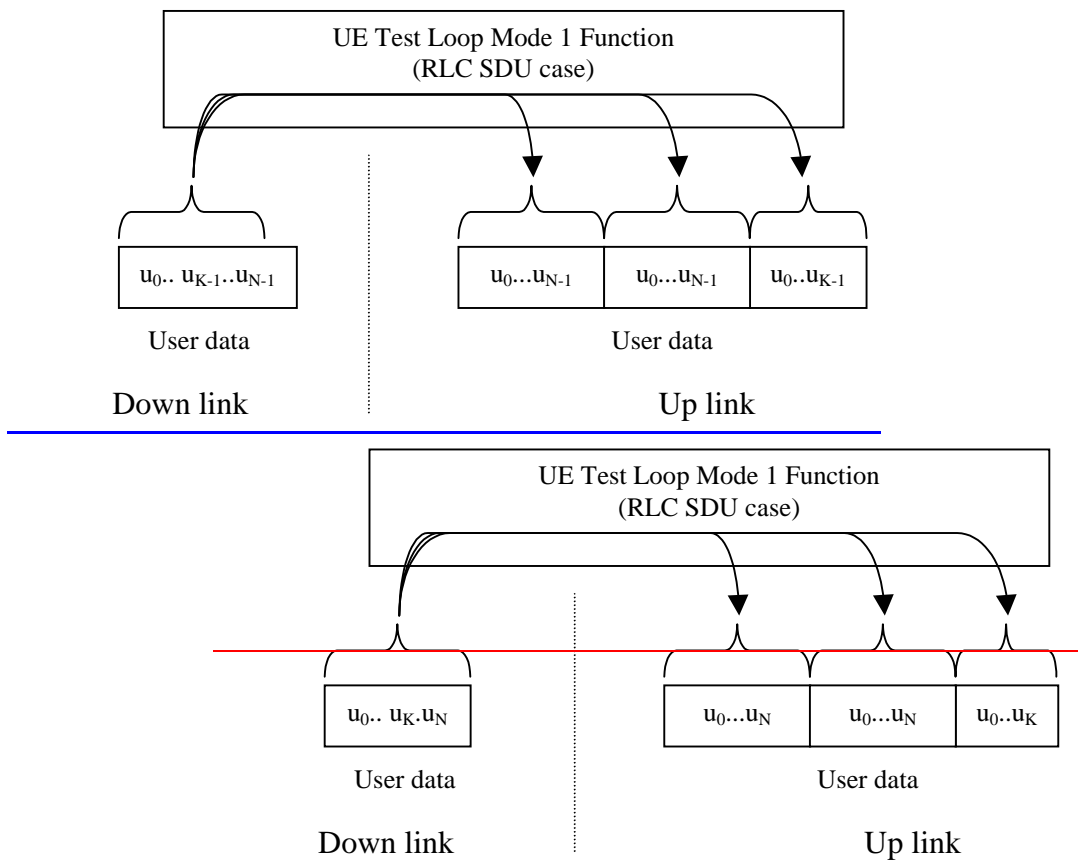
**Figure 5.3.2.6.2.1: DL and UL RLC SDU block size equal (DL RLC SDU size = UL RLC SDU size = N+1)**

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+1, UL RLC SDU size = K+1)**

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 =  $N+1$ , UL RLC SDU size =  $2*N + K(N+1) + (K+1)$ )

### 5.3.2.7 UE test loop mode 2 operation

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

For 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 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

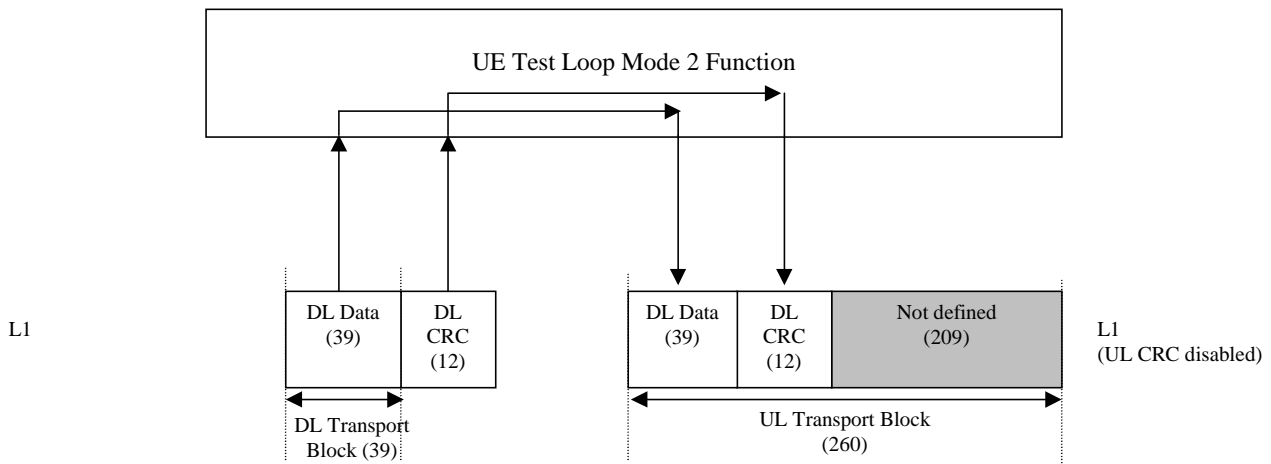
If UE test mode 2 has been selected then the following loop back scheme shall be performed by the UE:

After the UE has closed the test loop then the UE shall copy the received downlink transport block and CRC bits to the up link transport block and transmit in the up link.

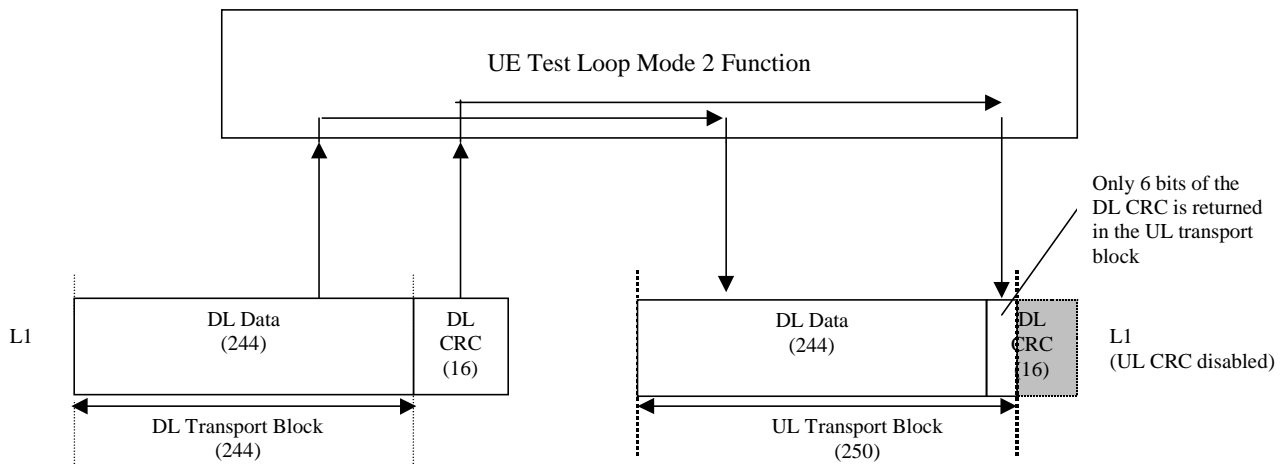
If the uplink radio bearer configuration is of variable rate then the transport format with the smallest transport block size which fits the downlink transport block size and the downlink CRC bits shall be selected in uplink. In case there is no transport format that fits the downlink transport block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

UE test mode 2 operation is illustrated for the case when uplink transport block size is bigger than the sum of 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 Transmission of dummy messages on DCCH

If ~~When~~ UE test loop mode 1 or 2 is active and the active radio bearer configuration includes an uplink DCCH mapped to a DCH then:

If DCCH dummy ~~transmission mode~~ is enabled and there is no DCCH data to be sent (i.e. there are no Layer 2/3 messages to be sent) then the UE shall set all bits in the uplink DCH transport block associated with a DCCH to 1, see figure 5.3.2.8.1.

If DCCH dummy ~~transmission mode~~ is enabled the SS shall discard any received DCH transport blocks associated with a DCCH having its bits set to 1.

NOTE 1: DCCH dummy transmission is only intended for uplink RF testing for which reference radio measurement channels according to TS 25.101, Annex A for FDD mode and to TS 25.102, Annex A for TDD mode respectively are used.

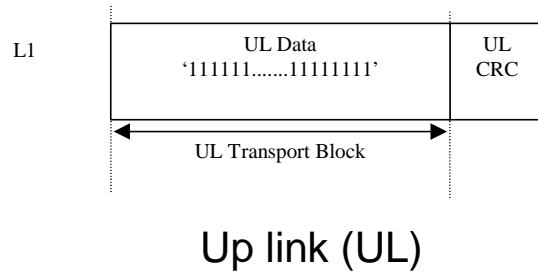


Figure 5.3.2.8.1. Bit pattern to use for DCCH dummy transmission

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## CHANGE REQUEST

⌘ **34.109 CR 012** ⌘ ev **-** ⌘ Current version: **4.1.0** ⌘

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<b>Source:</b>	⌘ TSG-RAN WG2		
<b>Work item code:</b>	⌘ TEI <span style="float: right;"><b>Date:</b> ⌘ 2002-02-18</span>		
<b>Category:</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;">                 ⌘ <b>A</b>                  Use <u>one</u> of the following categories:  <b>F</b> (correction)  <b>A</b> (corresponds to a correction in an earlier release)  <b>B</b> (addition of feature),  <b>C</b> (functional modification of feature)  <b>D</b> (editorial modification)                  Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a>.             </td> <td style="width: 50%; vertical-align: top;"> <b>Release:</b> ⌘ <b>REL-4</b>                  Use <u>one</u> 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)             </td> </tr> </table>	⌘ <b>A</b> Use <u>one</u> of the following categories: <b>F</b> (correction) <b>A</b> (corresponds to a correction in an earlier release) <b>B</b> (addition of feature), <b>C</b> (functional modification of feature) <b>D</b> (editorial modification) Detailed explanations of the above categories can be found in 3GPP <a href="#">TR 21.900</a> .	<b>Release:</b> ⌘ <b>REL-4</b> Use <u>one</u> 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)
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<b>Reason for change:</b> ⌘	<ol style="list-style-type: none"> <li>1. Clarification of UE behaviour when radio bearer test mode active.</li> <li>2. Clarification of UE behaviour when CLOSE UE TEST LOOP message is received by the UE.</li> <li>3. Clarification of applicability of DCCH dummy message functionality.</li> <li>4. Editorial corrections</li> </ol>
<b>Summary of change:</b> ⌘	<ol style="list-style-type: none"> <li>1. Following changes have been introduced to clarify UE behaviour when radio bearer test mode is active:                     <ol style="list-style-type: none"> <li>a. Clause 5.2.1.3, added sentence to clarify UE behaviour regarding CC and SM when radio bearer test mode is activated</li> <li>b. Clause 4.3, 5.3.2.2 and 5.3.2.3 modified to clarify that SS can only request closing of UE test loops when the UE radio bearer test mode is active.</li> </ol> </li> <li>2. Added sentence in clause 5.3.2.3 to clarify UE behaviour when receiving CLOSE UE TEST LOOP message when UE test loop already is closed.</li> <li>3. Clause 5.3.2.8, modified prerequisite to clarify that DCCH dummy transmission is only applicable for uplink radio bearer configurations having a DCCH mapped to a DCH.</li> <li>4. Editorial corrections.                     <ol style="list-style-type: none"> <li>a. Figure 5.1.1, "Control" changed to "Signalling Data".</li> <li>b. Figures 5.3.2.6.1.1, 5.3.2.6.2.1, 5.3.2.6.2.2 and 5.3.2.6.2.3 changed to be consistent with the text regarding the numbering of bits and the SDU size.</li> <li>c. Clause 5.3.2.1, changed "RAB" to "radio bearer"</li> </ol> </li> </ol>



<b>Consequences if not approved:</b>	⌘	
<b>Clauses affected:</b>	⌘	4.3, 5.1, 5.2.1.3, 5.3.2.1, 5.3.2.2, 5.3.2.3, 5.3.2.6.1, 5.3.2.6.2, 5.3.2.8
<b>Other specs affected:</b>	⌘	<input type="checkbox"/> Other core specifications      ⌘ 34.109 v3.4.0, CR 011 <input type="checkbox"/> Test specifications <input type="checkbox"/> O&M Specifications
<b>Other comments:</b>	⌘	

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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.



## 4.2 UE radio bearer test mode

The UE radio bearer test mode is specified in clause 5.2.

The following TC procedures are used to control the UE radio bearer test mode:

- Activate UE radio bearer test mode
- Deactivate UE radio bearer test mode

## 4.3 UE test loop

The UE test loop function is specified in clause 5.3.

The following TC procedures are used to control the UE test loop function:

- Close UE test loop
- Open UE test loop

[A prerequisite for the UE test loop function is that the UE radio bearer test mode is active.](#)

## 4.4 EMMI

The EMMI is specified in clause 7.

No specific TC procedures are associated with EMMI.

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# 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 1: 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.

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 clause 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 [3] TS 25.101, Annex A for FDD and by [4] TS 25.102, Annex A 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 clause 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.

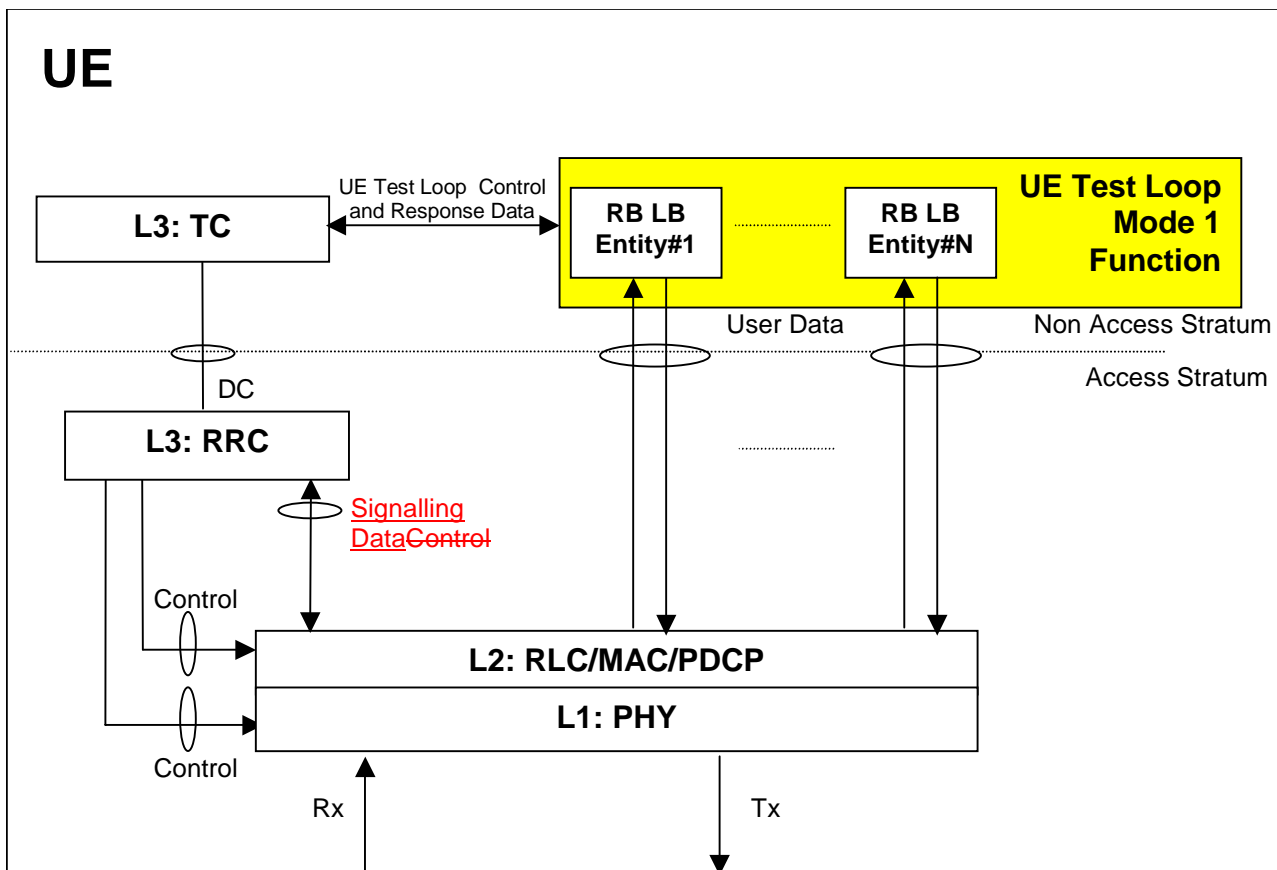


Figure 5.1.1: UE Test Loop Mode 1 function (TC =Test Control, LB = Loop Back entity)

## 5.2 UE radio bearer test mode procedures

### 5.2.1 Activate UE radio bearer test mode

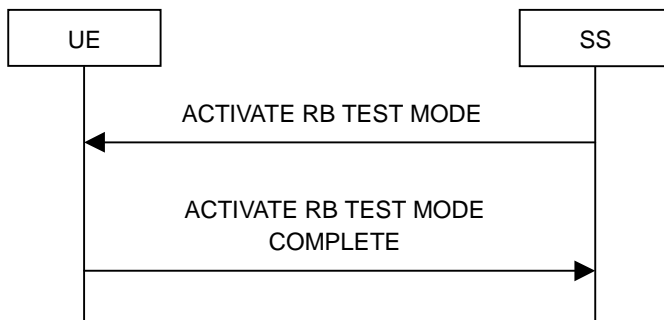


Figure 5.2.1.1: Activate UE radio bearer test mode procedure

### 5.2.1.1 General

The SS uses the activate UE radio bearer procedure to get UE into a test 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 (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 UE receives 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
- 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

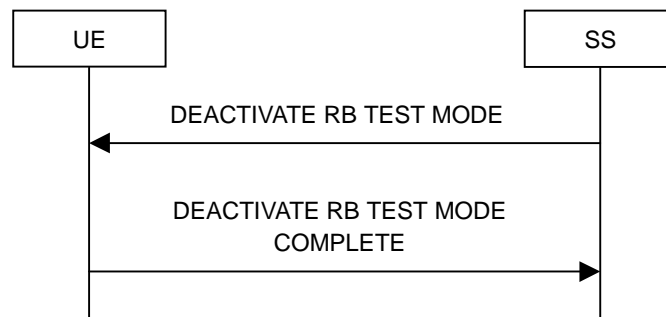


Figure 5.2.2.1: Deactivate UE radio bearer test mode procedure

### 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

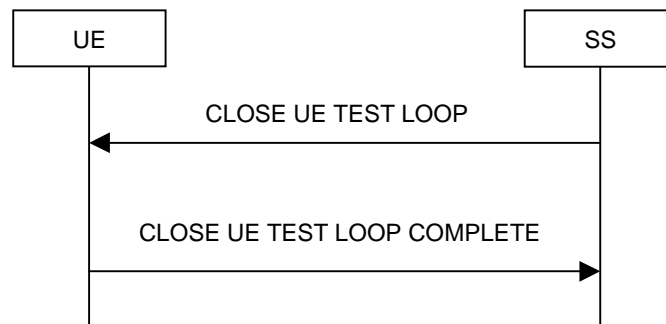


Figure 5.3.2.1: Close UE test loop procedure

#### 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 a [radio bearer RAB](#) has been established between SS and UE. See [10] TS 34.108, 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 RAB](#) disconnection, the loopback shall cease to exist.

#### 5.3.2.2 Initiation

[The SS can request UE to close a test loop if a 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 radio bearer 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 radio bearer is established, the UE shall close the test loop and then send back to the SS a CLOSE UE TEST LOOP COMPLETE message. The loopback shall ~~be~~ be operational prior to the sending of the acknowledgement.

If the test loop is already closed, the UE shall still respond as if the loop had been open, i.e. the CLOSE UE TEST LOOP COMPLETE message shall ~~be~~ 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 mode 1 has been selected then the loop back scheme according to 5.3.2.6 shall be performed by the UE.

If UE test mode 2 has been selected then the loop back scheme according to 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 radio bearer includes the PDCP protocol layer then the loop back scheme according to 5.3.2.6.1 shall be performed by the UE for the actual radio bearer.

If the PDCP protocol layer is not used for a radio bearer then the loop back scheme according to 5.3.2.6.2 shall be performed by the UE for the actual radio bearer.

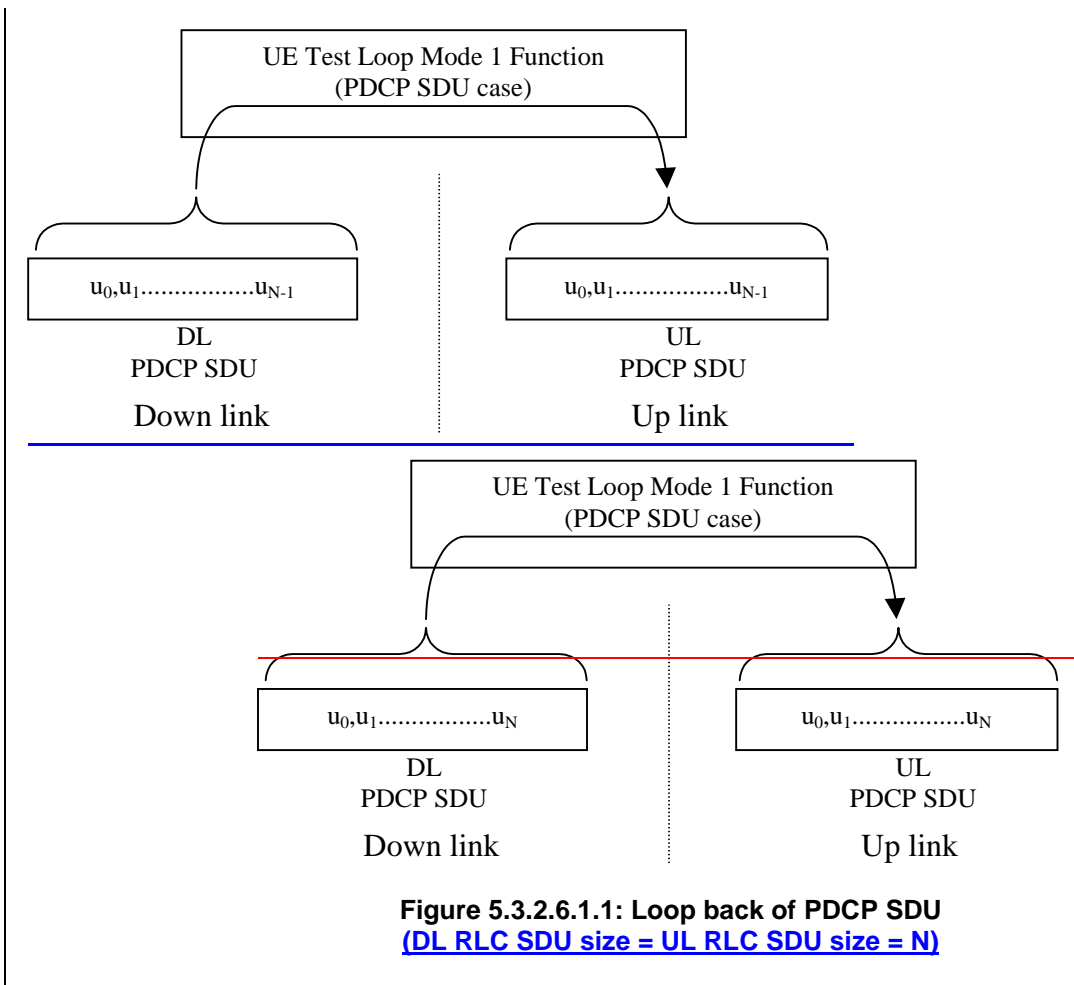
5.3.2.6.1 Loopback of PDCP SDUs

If UE test mode 1 have been selected and the radio bearer setup includes configuration of PDCP protocol layer then the following loop back scheme shall be performed by the UE:

After the UE has closed its radio bearer test loop, every PDCP SDU received by the UE on the 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.



5.3.2.6.2 Loopback of RLC SDUs

If UE test mode 1 has been selected and radio bearer setup does not include configuration of PDCP protocol layer then the following loop back scheme shall be performed by the UE:

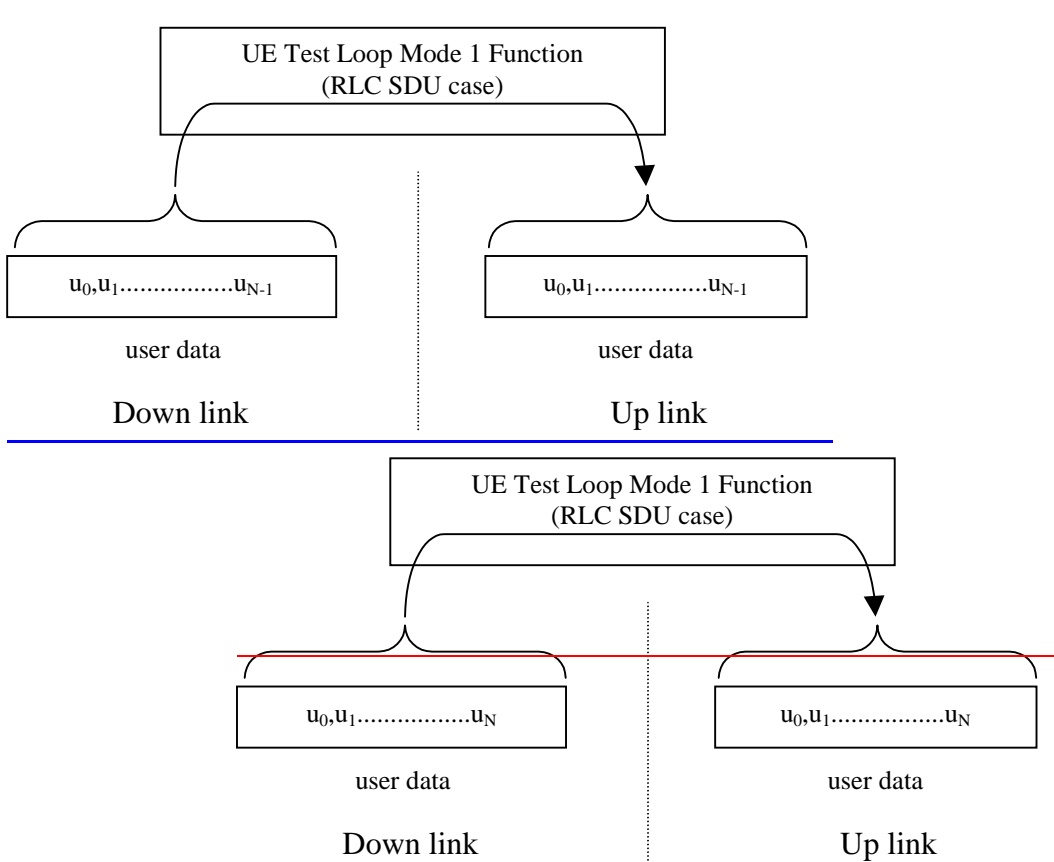
After the UE has closed its radio bearer test loop, every user data block received by the UE on the active radio bearer (downlink) shall be taken from the output of the RLC service access point (SAP) and be input to the correspondent RLC SAP and transmitted (uplink). The UE reads the UL RLC SDU size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

If no "LB Setup RB IE#k" parameter is associated with the 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.

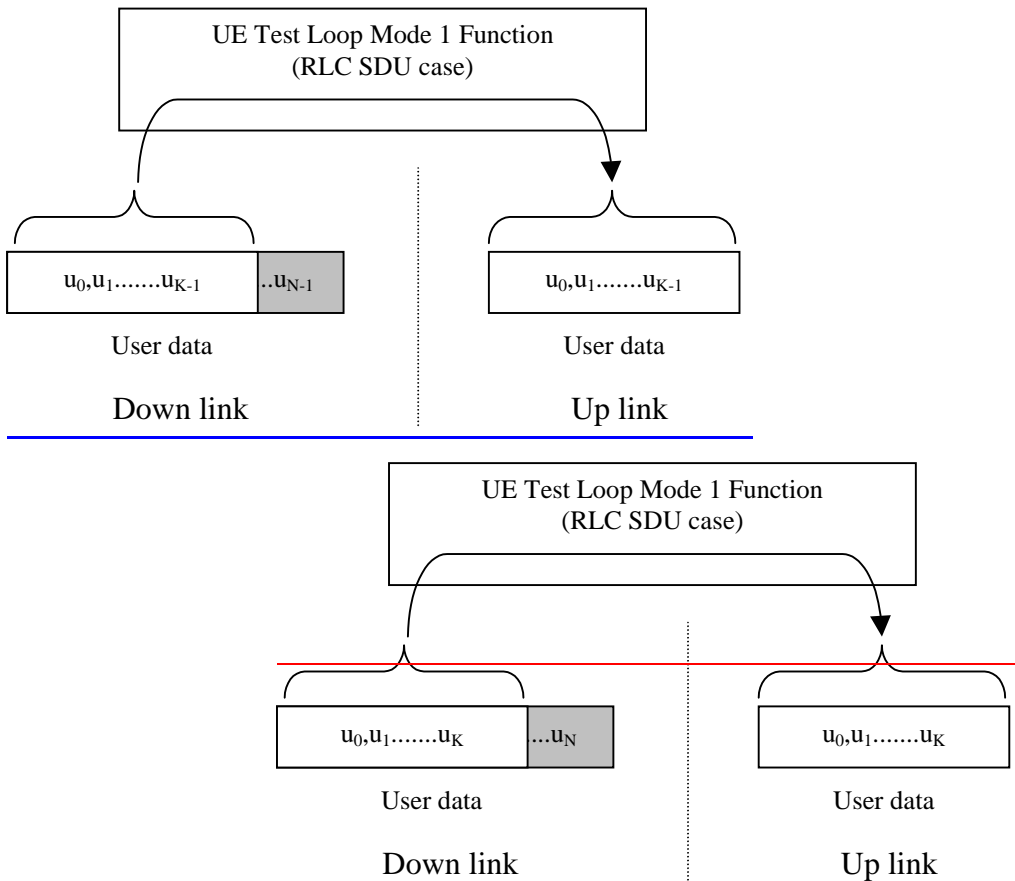


For the case when the "UL RLC SDU size" parameter is set to the same value as the down link (DL) RLC SDU block size then the complete user data block shall be returned, see figure 5.3.2.6.2.1.



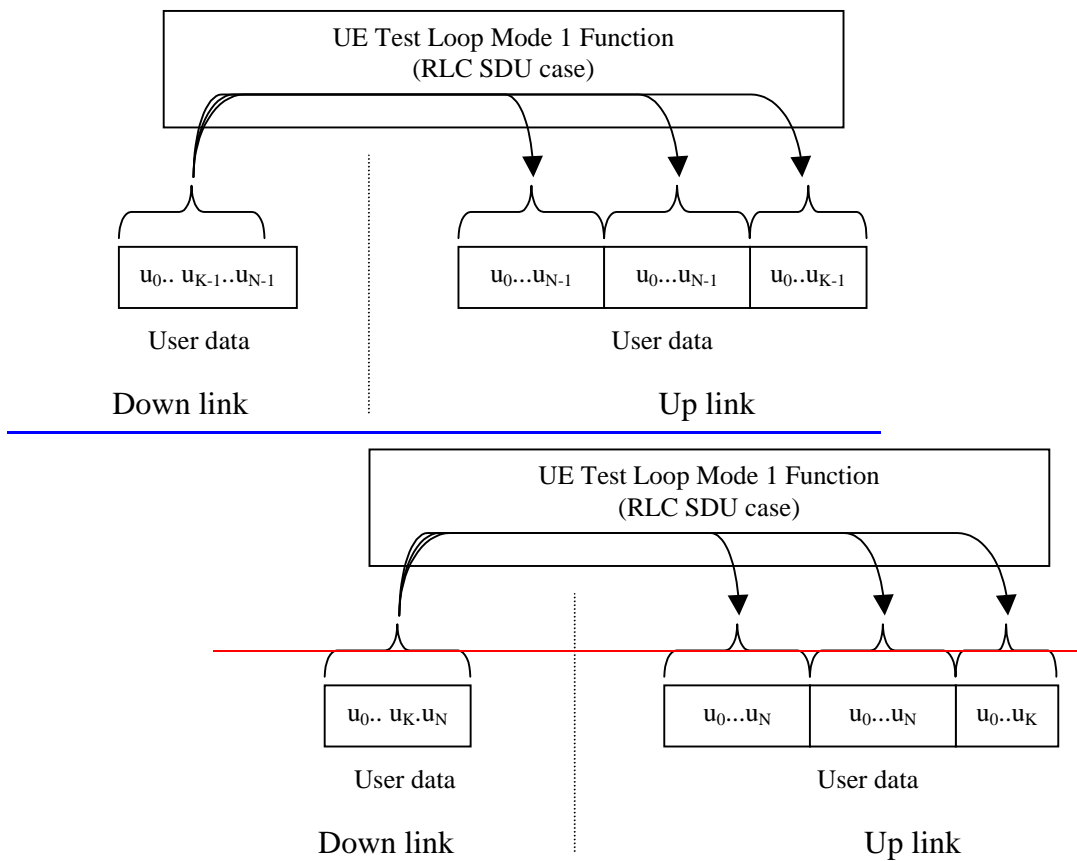
**Figure 5.3.2.6.2.1: DL and UL RLC SDU block size equal (DL RLC SDU size = UL RLC SDU size = N+1)**

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+4, UL RLC SDU size = K+4)**

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 =  $N+1$ , UL RLC SDU size =  $2*N + K(N+1) + (K+1)$ )

### 5.3.2.7 UE test loop mode 2 operation

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

For 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 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 mode 2 has been selected then the following loop back scheme shall be performed by the UE:

After the UE has closed the test loop then the UE shall copy the received downlink transport block and CRC bits to the up link transport block and transmit in the up link.

If the uplink radio bearer configuration 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 uplink. In case there is no 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.

UE test mode 2 operation is illustrated for the case when uplink transport block size is bigger than the sum of 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.

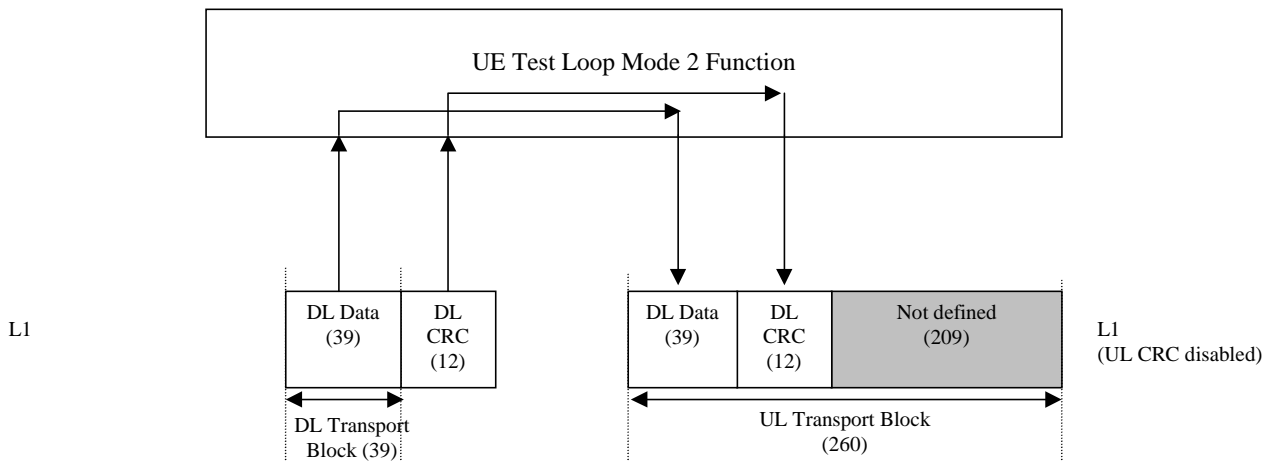


Figure 5.3.2.7.1. UE test loop mode 2 operation for the case when uplink transport block size is bigger than the sum of downlink transport block size and size of downlink CRC

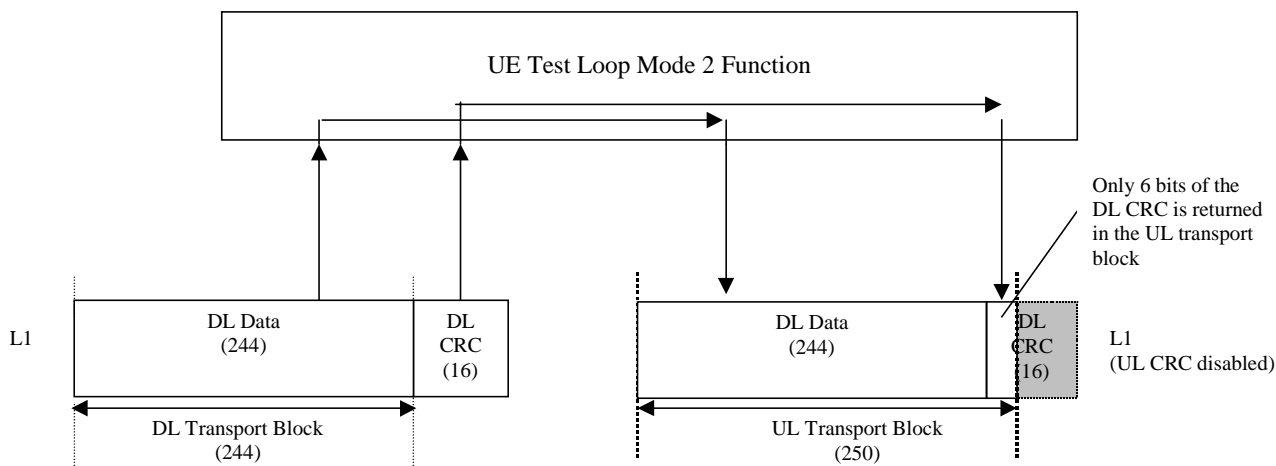


Figure 5.3.2.7.2. UE test loop mode 2 operation for the case when uplink transport block does not fit downlink transport block and downlink CRC bits.

### 5.3.2.8 Transmission of dummy messages on DCCH

If ~~When~~ UE test loop mode 1 or 2 is active and the active radio bearer configuration includes an uplink DCCH mapped to a DCH then:

If DCCH dummy ~~transmission mode~~ is enabled and there is no DCCH data to be sent (i.e. there are no Layer 2/3 messages to be sent) then the UE shall set all bits in the uplink DCH transport block associated with a DCCH to 1, see figure 5.3.2.8.1.

If DCCH dummy ~~transmission mode~~ is enabled the SS shall discard any received DCH transport blocks associated with a DCCH having its bits set to 1.

NOTE 1: DCCH dummy transmission is only intended for uplink RF testing for which reference radio measurement channels according to TS 25.101, Annex A for FDD mode and to TS 25.102, Annex A for TDD mode respectively are used.

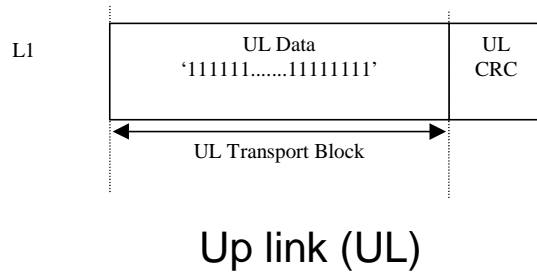


Figure 5.3.2.8.1. Bit pattern to use for DCCH dummy transmission