ETSI TECHNICAL REPORT

ETR 293-1

February 1997

Source: ETSI TC-RES

Reference: DTR/RES-06012-1

ICS: 33.020

Key words: Layer 2, layer 3, protocol, radio, SDL, TETRA, validation

Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Air Interface (AI) layer 2 and 3 protocol validation; Part 1: Validation of SDL models for Voice plus Data (V+D)

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Foreword

This ETSI Technical Report (ETR) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

This ETR consists of 3 parts as follows:

Part 1: "Validation of SDL models for Voice plus Data";

Part 2: "Validation of SDL models for Packet Data Optimized (PDO)", (DTR/TETRA-04012-2);

Part 3: "Validation of SDL models for Security functions", (DTR/TETRA-06012-3);

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1 Scope

This ETSI Technical Report (ETR) defines the methods, procedures, and validation purposes used for the formal validation of the Specification and Description Language (SDL) model of Trans-European Trunked Radio (TETRA), Voice plus Data (V+D), Air Interface (AI) and documents the results of the validation.

The validation of the TETRA SDL specifications covers the TETRA AI, layer 2 and 3 protocols for V+D.

2 References

For the purposes of this ETR, the following references apply:

[1] ETS 300 392-1: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".

[2] ETS 300 392-2: "Radio Equipment and Systems (RES); Trans-European Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".

[3] ITU-T Recommendation Z.100 (1993): "Specification and description language (SDL)".

[4] ITU-T Recommendation Z.120 (1993): "Message sequence charts".

[5] ISO.8348: "Information processing systems - Data communications - Network service definition".

[6] ISO.8878: "Use of X.25 to provide the OSI connection mode network service".

[7] ISO.8648: "Information processing systems - Internal organisation of the network layer".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETR, the following definitions apply:

acknowledged data transfer: A service provided by the layer below which gives an acknowledgement back over the air interface from the lower layer peer entity. This service is used by the layer 3 entities to get a secure transmission including re-transmissions.

Advanced Link: An Advanced Link (AL) is a bi-directional connection between one Mobile Station (MS) and a Base Station (BS) with provision of acknowledged and unacknowledged services including windowing, segmentation, extended error protection and choice among several throughputs. The data transfer via the advanced link requires a set-up phase.

announced cell re-selection: Cell re-selection where MS Mobile Link Entity (MLE) informs the Switching and Management Infrastructure (SwMI) both in the serving cell and in the new cell that cell change is performed. There can be three types of announced cell re-selection:

- type 1: the MS-MLE knows the new cell and the traffic channel allocations on the cell before deciding to leave its serving cell;

- type 2: the MS-MLE knows the new cell before changing to it, but does not know the channel allocation on the new cell in advance;

- type 3: the MS-MLE need not to know the new cell before changing to it. The serving cell is only informed by the MS-MLE that it wants to change cell.

TETRA V+D may support all three types of announced cell re-selection.

Basic Link: A Basic Link (BL) bi-directional connectionless path between one or several MSs and a BS, with a provision of both unacknowledged and acknowledged services on a single message basis.

cell re-selection: The act of changing the serving cell from an old cell to a new cell. The cell re-selection is performed by procedures located in MLE and in the Medium Access Control (MAC). When the re-selection is made and possible registration is performed, the MS is said to be attached to the cell.

current serving BS: The BS on one of whose channels the MS is currently operating.

direct set-up signalling: A signalling procedure where immediate communication can take place between the calling and the called users without the alerting process and without an explicit response from the called user that he has answered.

executable validation model: Executable version of the validation model that can be used in the actual validation session for simulation and trace generation.

initial cell selection: The act of choosing a first serving cell to register in. The initial cell selection is performed by procedures located in MLE and in the MAC. When the cell selection is made and possible registration is performed, the MS is said to be attached to the cell.

migration: The act of changing to a new Location Area (LA) in a network (either with different Mobile Network Code (MNC) and/or Mobile Country Code (MCC)) where the user does not have Individual TETRA Subscriber Identity (ITSI) for that network.

monitoring: The acts of measuring the power of neighbour cells and calculate the path loss parameter C2 based upon information on neighbour cells broadcasted by the serving cell.

on/off hook signalling: A signalling procedure that includes an alerting process to the called user. The calling user waits for an explicit response from the called user that he has answered before the call can be set-up.

protocol event: An indivisible and fundamental unit of protocol functionality; e.g. a reception of a Service Primitive (SP) or a transmission of a Protocol Data Unit (PDU); a set of which is the basis for constructing validation cases.

roaming: The act of changing Location Area within a network of same MNC/MCC, and for which the user has a valid registration (ITSI).

scanning: The acts of measuring the power of neighbour cells and calculate the path loss parameter C1 based upon the information on the neighbour cells broadcast by the neighbour cells themselves.

SDU number: A number on the Logical Link Control (LLC) to keep TL-SDUs in order.

segment: A LLC segment is the advanced link unit of transmission and re-transmission. A segment is the numbered piece of a TL-SDU fitting into one MAC layer PDU (MAC block). A segment is a synonym to a PDU.

serving cell: The cell that is currently providing services to the MS.

surveillance: The process of monitoring the quality of the radio link to the serving cell.

subscriber class: A subscriber class has no other defined usage than offering a population subdivision. The operator defines the values and meaning of each class.

TETRA Subscriber Identity (TSI): A global TETRA network address that is to identify an individual or a group subscriber within the domain of all TETRA networks. A valid TSI refers to a TSI that has been allocated by the network where it is being used. See ETS 300 392-1 [1] for definition.

unacknowledged data transfer: A service that does not give any acknowledgement back to the service user.

unannounced cell re-selection: Cell re-selection where the MS-MLE does not inform the serving cell that it intends to change to a new cell. Only the new cell is informed about the MS-MLE.

undeclared cell re-selection: Cell re-selection where the MS-MLE does not inform the serving cell nor the new cell that cell change is performed.

validation case: A set of validation events designed to achieve a particular validation purpose.

validation model: A model for the protocol specified with a formal description technique, in this case, SDL.

validation purpose: A single requirement of a protocol in the scope of validation.

validation script: A validation case or a subset of it presented in a manner, that can be used to activate and trace the protocol transitions in execution of the validation model.

3.2 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

AI	Air Interface
AL	Advanced Link sub-entity within LLC
BL	Basic Link sub-entity within LLC
BS	Base Station
CC	Call Control sub-entity within CMCE
CMCE	Circuit Mode Control Entity
CONP	Connection Oriented Network Protocol
ETR	ETSI Technical Report
FCS	Frame Check Sequence
GTSI	Group TETRA Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
LA	Location Area
LLC	Logical Link Control
LLME	Lower Layer Management Entity
MAC	Medium Access Control
MCC	Mobile Country Code
MLE	Mobile Link Entity
MM	Mobility Management
MNC	Mobile Network Code
MNI	Mobile Network Identity
MS	Mobile Station
MSC	Message Sequence Chart
PDU	Protocol Data Unit
QoS	Quality of Service
RES	Radio Equipment and Systems
SCLNP	Specific Connectionless Network Protocol
SAP	Service Access Point
SDL	Specification and Description Language
SDS	Short Data Services sub-entity within CMCE
SDU	Service Data Unit
SP	Service Primitive
SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TDMA	Time Division Multiple Access
TEI	TETRA Equipment Identity
TETRA	Trans European Trunked RAdio
TL-SDU	SDU from the LLC service user, i.e. MLE
TLA-SAP	A layer 2 Service Access Point
TLB-SAP	A layer 2 Service Access Point
TLC-SAP	A layer 2 Service Access Point
TM-SDU	SDU from the layer above MAC, i.e. LLC
TSI	TETRA Subscriber Identity
V+D	Voice plus Data

4 Introduction

This ETR documents the validation of the TETRA protocols for V+D AI (see ETS 300 392-2 [2]). The purpose of the validation is to check that the required service and protocol functionality is supported by the specified protocols on the MS side of the Air Interface (AI).

The validation of the protocols has been performed using the latest specification methodologies, techniques and tools available.

A comprehensive validation model has been specified using SDL, covering the mandatory protocol functionality, and also a significant number of the optional features specified in the V+D.

Code generation was used to create an executable validation model from the SDL specification. The executable validation model was then used for simulation against the selected set of protocol requirements. The simulation was performed using advanced simulation techniques, including Message Sequence Chart (MSC) trace generation.

During the specification and simulation of the validation model a number of minor errors in the protocol descriptions were identified. All these inaccuracies are documented, and, generally, a proposal for solution is given in this ETR. Taking these proposals into account, the validation has demonstrated that an operational TETRA V+D AI protocol stack can be implemented according to ETS 300 392-2 [2].

5 General

5.1 The validation principles

The validation of the required service functionality is performed using a set of selected requirements, derived from the textual protocol specifications. The selected requirements are expressed in terms of validation cases. Also a validation model is derived from the same textual protocol specifications. This validation model should reflect correctly the defined protocol behaviour. These principles are illustrated in figure 1.

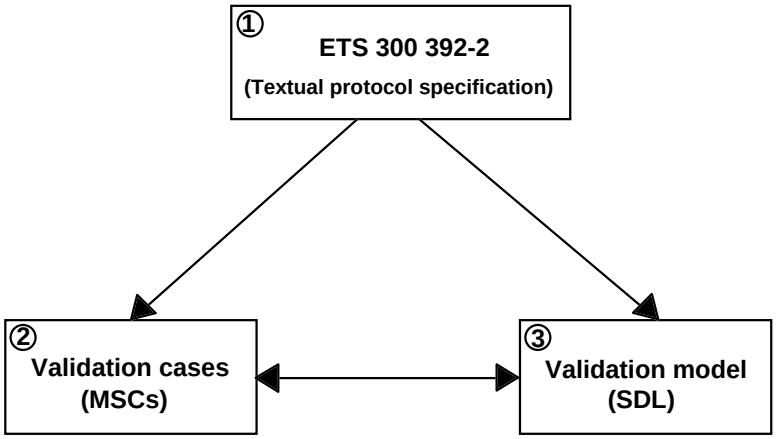

Figure 1: The principle of the validation process

Then, the purpose of the validation is to check if the validation model satisfies the selected requirements, and hence if the protocol descriptions correctly define the service functionality. Use of two independent formalizations of the textual standard improves the probability that the protocol description is consistently expressing the validated requirements.

The value of validation using this approach is heavily dependent on the quality of the mapping from the selected requirements of the textual protocol specification to the validation cases representing the validation requirements. However it is necessary to formalize the textual protocol specification in order to allow the validation process to be carried out by computer tools. The formalization is done by converting the textual protocol specification into SDL and express the validation cases in terms of MCSs.

The requirements for a protocol can be categorized into three different classes referring to the following three aspects of protocol validation:

1) service validation;

2) protocol validation;

3) protocol stack validation.

Service validation is checking that the requirements at the service interface are satisfied by a single protocol entity.

Protocol validation includes single protocol entity validation and peer-to-peer validation. Single protocol entity validation is concentrated on the mapping between service primitives and PDUs. Additionally, peer-to-peer validation covers the PDU exchange between peer entities.

Protocol stack validation is validation of protocol entities of different layers linked together.

5.2 Validation architecture

The general outline of the validation performed is illustrated in figure 2, where also the relationship with the three concepts of figure 1 is indicated.

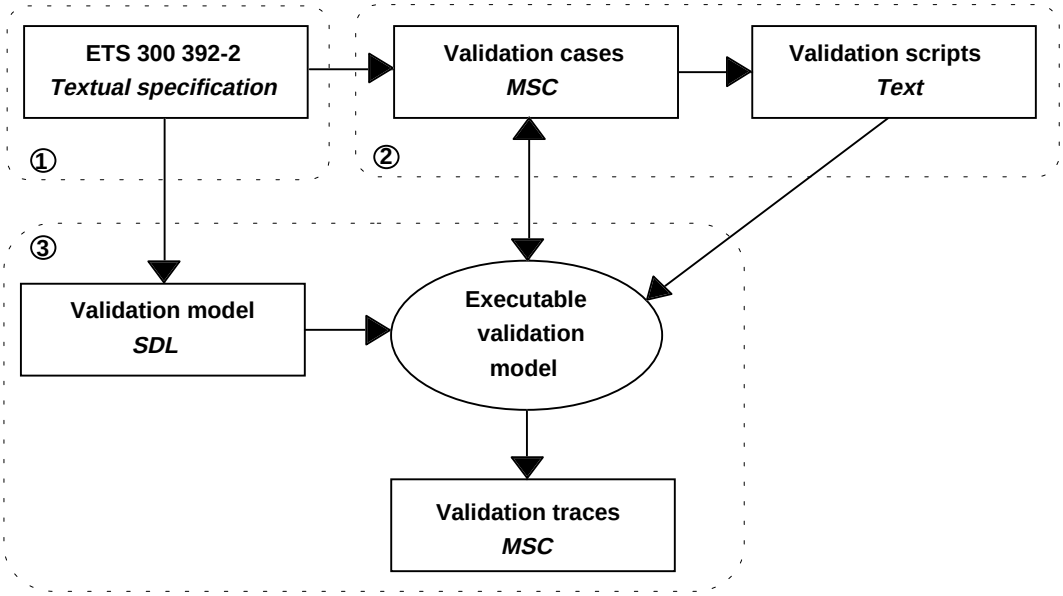

Figure 2: Architecture of the validation

The validation model and the validation cases are established based on the textual protocol specification.

The validation model is implemented as SDL specifications for each protocol as recommended by ITU-T Recommendation Z.100 [3]. Validation cases and validation traces are presented as MSC diagrams. MSC diagrams follow the corresponding ITU-T Recommendation Z.120 [4].

All important requirements of the protocols have to be expressed in the scope of validation purposes and thus, also in the validation cases. Additionally, an MSC only specifies a single sequence of validation events. So for that reason a set of MSCs may be needed for the specification of one validation case.

An MSC of a validation case contains a representation of an N - service user, N - protocol, N - formatter, and (N-1) - service provider. So the protocol events, i.e. N - SPs, N - PDUs and (N-1) - SPs can be traced from an MSC respectively.

Hence validation of protocol behaviour requirements is done in terms of the protocol events of the validation cases. In addition, requirements on the data part of the protocols must be validated. An exhaustive validation is not feasible due to the number of combinations of data values. So a limited number of combinations of data values are to be selected. For this selection the following rules are applied. When a value of a service data parameter affects the future behaviour of the protocol, data values for all possible behaviours have to be defined. Boundary values are used for this sort of validation.

To perform the validation, the validation model has to be made ready for simulation, i.e. executable. This is done automatically by the tools used for the validation.

In order to perform the simulation, a set of validation scripts has been derived from the validation cases. This has been done by providing all the necessary signals and parameters to make a validation case processable in combination with the executable validation model. In addition, the validation scripts contain commands to configure the simulation environment, e.g. breakpoint settings. Since the format of the validation scripts is tool-dependent and the scripts are only used to send the necessary protocol events already presented in the validation cases to the executable validation model, they are not part of the documentation of the validation process.

Finally, validation traces can be produced by executing the validation model. These traces are then compared to the validation cases and the result analysis of the validation follows.

Only validation traces of the whole protocol stack are included in the documentation of the validation process, since also protocol events of the individual protocol entities can be extracted from these traces.

A minimum requirement for the validation performed is that all parts of the validation cases have been verified at least once during the validation.

NOTE: The validation is restricted to the MS side of the protocols, but a parallel model for the BS side is made for simulation purposes solely. Due to this, the BS model is not part of the validation documentation.

5.3 The validation process

To accomplish the validation results, the following validation scheme has been used to implement the validation principles described in subclause 5.1:

- protocol validation process; and

- protocol stack validation process.

In this scheme the service validation is performed in two parts.

The first part of the service validation is performed as part of the protocol validation, when the SP - PDU relationship inside a protocol entity is validated.

The second part of the service validation is performed while incrementally validating the protocol stack. That is when the interaction between a protocol entity and the one above it inside one stack is validated.

For the highest service interface within the scope of the validation, the service validation is done manually during the validation sessions, e.g. validation script acting as a service user of the protocol.

So following this scheme, validation results for all three categories of requirements (service, protocol, and protocol stack) are achieved.

5.3.1 Protocol validation process

The protocol validation process is divided into two phases:

- single protocol entity validation;

- peer-to-peer validation.

The first phase is to validate the MS entity of the protocol. This is where the relationship between the services provided by the protocol and PDUs sent and received is validated.

Peer-to-peer validation is performed between the MS and the BS entities of the same protocol. In this phase, protocol requirements for the PDU exchange are validated.

NOTE: It may not be obvious how the peer-to-peer validation is performed if the validation cases describe only the MS side. However, this is possible, since the MSCs include both incoming and outgoing PDUs, and thus describe the requirements of the actual protocol.

5.3.2 Protocol stack validation process

The validation of the protocol stack is done in an incremental way performing initially a layer-by-layer validation. When this validation has been performed, validation of the complete stack has been performed. In this way error cause tracing is simplified.

The process of the protocol stack validation is based on the same validation cases as the ones used for individual protocol validation. To verify correct protocol stack behaviour, more than one validation case may have to be used.

The protocol stack validation includes validation of the normative interfaces at layer 2 and 3, which will also be used for the protocol conformance test suites.

5.3.3 Validation result analysis

If a validation case can be verified by execution of the validation model, it is assumed that the textual protocol description has correctly defined the corresponding validation purpose. However, if an error is detected during the validation the following procedure is applied.

1) Check if the validation case consistently reflects the selected requirement of concern in the textual protocol specification. If the MSC is incorrect it is updated and the validation execution is repeated.

2) If the error detected can be determined to be an error in the validation model of the protocol, the SDL specification is updated and the validation execution is repeated.

3) If the cause of the non-conformance detected by the validation, is due to a contradiction in the textual protocol standard. An error report is provided and, if possible, a solution is proposed which will in the first place be implemented in the validation model. However for a final solution to such "errors" a resolution from the responsible party has to be provided.

   NOTE: All instances of detected non-conformance during the validation process will be documented.

5.3.4 Tool support

The validation is performed using the advanced facilities of the SDT SDL tool. This includes the simulator and support for MSC trace generation, and automated check of validation scripts against the executable validation model.

Also, the tool is used to ensure that the SDL models of the protocols comply with the syntax and semantics of the SDL language.

5.4 Documentation of the validation process

The documentation of the validation contains the following information:

- validation purposes;
- options, constants and parameters used in the validation;
- validation cases;
- validation traces.
- validation results.

The validation purposes lists the requirements selected for validation for each protocol entity and so identifies the validation cases used.

Optional features in the protocol are presented here in a table giving the values used while running the validation sessions.

The validation cases for each protocol entity are included in annex A as an attached electronic file. The same validation cases are used also for the protocol stack validation.

The validation traces produced with the validation model for the whole protocol stack are given in the electronic files attached to this ETR. The files, and their formats, are described in annex B.

The SDL validation model is given in the electronic files attached to this ETR. The files, and their formats, are described in annex C.

Any non-conformance found in the protocols or protocol stack is documented in the subclauses 6.1.3, 6.2.3, 6.3.3, 6.4.3, 6.5.3, 6.6.3 and 6.7.3.

A summary of the validation results is given in subclause 7.4.

5.5 Validated protocols

The TETRA V+D SDL protocol specifications validated are shown in table 1.

Table 1: The protocols validated

Protocol	Validation	Remarks
CMCE	Service Protocol Protocol stack	 CMCE - MLE
MM	Service Protocol Protocol stack	 MM - MLE
CONP	Service Protocol Protocol stack	 CONP - MLE
SCLNP	Service Protocol Protocol stack	 SCLNP - MLE
MLE	Service Protocol Protocol stack	 MLE - LLC
LLC	Service Protocol Protocol stack	 LLC - MAC
MAC	Service Protocol	 MAC - MAC
Complete protocol stack		
NOTE: The validation required for the MAC to allow stack validation is peer-to-peer validation since there is no lower layer modelled.		

Due to the nature of Connection Oriented Network Protocol (CONP) and Specific Connectionless Network Protocol (SCLNP) being already standardized protocols and/or services, the actual validation of these protocols has been concentrated on the mapping with the services provided by underlying other TETRA-layers (see ISO.8348 [5] and ISO.8878 [6] for the definition of CONP and ISO.8648 [7] for the definition of SCLNP in addition to ETS 300 392-2 [2]).

The MAC protocol operation is fairly straightforward for SPs and PDUs, but a comprehensive validation model implementation requires some timing aspects and physical layer dependent matters to be taken into consideration, aspects which cannot easily be expressed in SDL. So, for the validation model of the MAC, it has only been specified with the properties that can be expressed using SDL, leaving out some real-time properties and physical layer aspects.

6 Protocol validation

The following subclauses describe the validation purposes, parameters used and the validation results for each validated protocol entity.

The validation purposes are introduced by textual means, while the validation cases specified as MSCs can be found in annex A for each protocol entity.

The option, constant and parameter values used in the model are shown together with the ranges stated in the textual protocol specification, i.e. some restrictions may apply for the validation model and not all values mentioned in the textual protocol specification may have been used in the validation.

A special format is used to present the validation results. All the results for each protocol are collected to a series of tables with the following fields present:

1) **No.**, which contains the name of the protocol considered and a running number for a reference inside the series of the protocol validation results;

2) **Reference**, or references, which always refer to the textual protocol specification ETS 300 392-2 [2], unless otherwise stated;

3) **Category**, which can be one of the following is recommended:

- normative, when the validation result found is related to the normative part of the protocol specification;
- informative, when the validation result found is related to informative parts of the protocol specification, e.g. most of the service primitives;
- editorial, in case of spelling mistakes or otherwise obvious or minor inconsistency found;

4) **Item**, which defines the specific subject as explicitly as possible;

5) **Validation decision**, which defines the solution for validation model. This field may marked as Not applicable if the validation result does not reflect any requirements for the validation model;

6) **NOTE**-field may be present for additional information and applicability of the subject.

No table headings are used, since the **No.** field is used as a reference to a specific table.

The MSCs presented in annex A, do not show all signals that can occur during the execution of the validation cases. Because of that, e.g. TMA-REPORT indication, may be left out in a diagram where it actually may appear in the validation model execution. This can happen if the signal is not directly related to the specific validation purpose.

All signal parameters given in MSCs are informal and signals may or may not contain parameters. Usually, only parameters directly affecting the protocol behaviour are presented. If parameters are present in a signal, they are normally present only a subset of all valid parameters for that signal. This partial specification of the parameters is due to readability, as some of the signals have several complex parameters.

6.1 Circuit Mode Control Entity (CMCE)

6.1.1 Validation purposes

The validation purposes for CMCE are divided into three groups "Individual call", "Group call" and "Short Data service". The purposes are concentrated on the basic functionality of the different call types.

The rejection and acceptance of basic service information are left to the service user.

6.1.1.1 Individual call

The following purposes are defined for handling an individual call:

1) individual call set-up using on/off hook signalling;

2) individual call set-up using direct set-up signalling;

3) transmission control;

4) call status information;

5) call restoration;

6) call disconnect;

7) colliding calls;

8) call rejection.

6.1.1.2 Group call

The following purposes are defined for handling group calls:

1) group call set-up;

2) transmission control;

3) call status information;

4) call restoration;

5) call disconnect;

6) colliding calls;

7) call rejection.

6.1.1.3 Short data services

The following purposes are defined for handling short data service:

1) incoming short data message;

2) outgoing short data message.

6.1.2 Options, constants and parameters

Table 2: Constant and parameter values used in the validation of CMCE

Name	Values used	Range	Remarks
No_Of_CC	1	1..n (note 1)	Number of concurrent instances of the Call Control (CC) service
HOME_ITSI	357, 975, 4545	(note 2)	The Home ITSI number (MCC, MNC, SSI)
T.301	30	1-30 Sec.	Call set-up Timer for called MS
T.302	60	1-60 Sec.	Call set-up Timer for calling MS
T.303	60	1-60 Sec.	Call Initiated Timer for calling MS
T.306	5	4-6 Sec.	Call restoration Timer for point-to-point calls
T.307	7	4-8 Sec.	Call restoration Timer for point-to-multipoint calls
T.308	10	1-10 Sec.	Call disconnect Timer
T.310	900	5-n Sec.	Call length Timer
T.311	30	1-300 Sec.	Call transmission Timer
NOTE 1: Only the value 1 can be used in this model. NOTE 2: For definition see ETS 300 392-1 [1], clause 7.			

6.1.3 Validation results

The results show that the CMCE protocol can function without changes needed in the PDUs and no normative errors were found. There are a few comments that could increase the readability of the CMCE protocol description in ETS 300 392-2 [2].

No.	CMCE 1	**Reference**	11.3.3	**Category**	Informative
Item					
In the service primitives for the Call-Control the fields Access priority and Traffic stealing are optional even if the PDU-Priority in the MLE-Unitdata-request is mandatory.					
Validation decision					
The Call-Control uses the low priority and no stealing for the MLE-Unitdata-request if the fields are not present in the Call-Control service primitives.					
NOTE:					

No.	CMCE 2	**Reference**	11.3.3	**Category**	Informative
Item					
The "Speech Service" parameter in TNCC-ALERT-Indication, TNCC-MODIFY-Indication, TNCC-PROCEED-Indication, TNCC-SETUP-Indication and TNCC-SETUP-Confirm is redundant. There is no corresponding element in the PDUs.					
Validation decision					
The Speech Service field is always "TETRA encoded speech" if the field "Circuit mode service" is the Speech service.					
NOTE:					

No.	CMCE 3	**Reference**	11.3.3.2	**Category**	Informative
Item					
In the service primitive TNCC-COMPLETE-Request, the fields Access priority and Traffic stealing are missing.					
Validation decision					
The Call-Control uses the low priority and no stealing for the U-Connect PDU when sent as a result of the TNCC-Complete-Request.					
NOTE:					

No.	CMCE 4	**Reference**	11.3.3.5	**Category**	Informative
Item					
In the TNCC-NOTIFY service primitive there is an optional field Call Poll Result Identifier, there is not a corresponding field in the D-INFO PDU.					
Validation decision					
The Field Call Poll Result Identifier is removed, the fields Poll Response Percentage, Poll Response number and Poll Response Addresses have changed from conditional to be optional.					
NOTE:					

No.	CMCE 5	**Reference**	11.3.3.8	**Category**	Informative
Item					
In the TNCC-SETUP-Confirm service primitive there is an optional field for "Request to Transmit/Send Data" this field does not make any sense in a confirm.					
Validation decision					
The field has been removed.					
NOTE:					

No.	CMCE 6	**Reference**	11.3.3.8	**Category**	Informative
Item					
In the TNCC-SETUP-Response service primitive there is a mandatory field for "Request to Transmit/Send Data" this field do not have any corresponding fields in the U-ALERT or U-CONNECT PDUs.					
Validation decision					
The field is removed.					
NOTE:					

No.	CMCE 7	**Reference**	11.3.3.9	**Category**	Informative
Item					
In the TNCC-TX-Request service primitive there is a mandatory field Transmission Status" this field does not make any sense in a Request.					
Validation decision					
The field has been removed.					
NOTE:					

No.	CMCE 8	**Reference**	11.3.4	**Category**	Informative
Item					
In the Parameter description for the "TX demand priority", there is a value for "No priority level". This does not have a corresponding value in the PDU definitions.					
Validation decision					
The value has been removed.					
NOTE:					

No.	CMCE 9	**Reference**	13.3.2	**Category**	Informative
Item					
The information in the Parameter "Called Party Type Identifier" from the TNSDS-STATUS-Indication and TNSDS-UNITDATA-Indication, is not known for the Short Data Services (SDS) entity. In these cases the SDS entity has information only on the address type (group or individual address), and the TSI number.					
Validation decision					
The field is not used.					
NOTE:					

No.	CMCE 10	**Reference**	14.4.2	**Category**	Informative
Item					
In figure 21 a state is missing for handle of a colliding Call.					
Validation decision					
The state "COLLIDING-CALL" has been added to the SDL model.					
NOTE:					

No.	CMCE 11	**Reference**	14.4.2	**Category**	Informative
Item					
It is not possible to receive D-SETUP in state "MT SETUP WAIT SwMI ACK". This will happen if U-CONNECT PDU is not received in the SwMI, as Acknowledged Response is used for the U-CONNECT PDU (There is no retransmission for Acknowledged Response see also LLC 24).					
Validation decision					
The U-CONNECT PDU is sent again if D-SETUP is received in state "MT SETUP WAIT SwMI ACK".					
NOTE:					

No.	CMCE 12	**Reference**	14.5	**Category**	Informative
Item					
In the MSCs for the CMCE procedures there are three report-indication signals. In the description of the MLE only one signal is sent with the transfer result.					
Validation decision					
The CMCE does not cancel any outstanding PDUs.					
NOTE:					

No.	CMCE 13	**Reference**	14.7.1.12	**Category**	Informative
Item					
The reason for the field "Calling Party type identifier" in the D-SETUP PDU is unclear. The information for the "Calling party address SSI" and the "Calling party extension" are already optional Type 2 elements with their own P-Bits. The same is unclear for the D-TX-GRANTED and D-TX-INTERUPT PDUs (in these primitives the names are "Transmitting party").					
Validation decision					
To leave the PDUs as they are.					
NOTE:					

No.	CMCE 14	**Reference**	14.4.2	**Category**	Editorial
Item					
In figure 22 the state names "MO SETUP" and "MT SETUP" shall be "MO-CALL-SETUP" and "MT-CALL-SETUP"					
Validation decision					
Not applicable					
NOTE:					

6.2 Mobility Management (MM) entity

6.2.1 Validation purposes

The validation purposes for MM are concentrated on the basic functionality of the different registration types.

6.2.1.1 Registration

The following purposes are defined for handling mobile registration:

1) activation;

2) registration;

3) de-registration;

4) energy economy mode;

5) disable.

6.2.1.2 Group attachment - detachment

The following purposes are defined for handling group number attachment - detachment:

1) user attachment - detachment of group identities;

2) network attachment - detachment of group identities.

6.2.2 Options, constants and parameters

Table 3: Constant and parameter values used in the validation of MM

Name	Values used	Range	Remarks
HOME_ITSI	357 975 4545	Note	The Home ITSI number (MCC, MNC, SSI)
TEI	774488	Note	The TETRA Equipment Identity (TEI) number
DUPLEX_SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
SINGLE_MULTI_SLOT_SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
CONCURRENT_MULTICARRIER_-OPERATION_SUPPORTED	FALSE	TRUE/FALSE	The value is used in Class Of MS
END_TO_END_ENCRYPTION_-SUPPORTED	FALSE	TRUE/FALSE	The value is used in Class Of MS
CLCH_NEEDED_ON_CARRIER_-CHANGE_SUPPORTED	FALSE	TRUE/FALSE	The value is used in Class Of MS
CONCURRENT_CHANNELS_-SUPPORTED	FALSE	TRUE/FALSE	The value is used in Class Of MS
MINIMUM_MODE_SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
CARRIER_SPECIFIC_SIGNALLING_-CHANNEL_SUPPORTED	FALSE	TRUE/FALSE	The value is used in Class Of MS
TETRA_AIR_INTERFACE_STANDARD_VERSION_NUMBER	0	0-7	The value is used in Class Of MS
CIRCUIT_MODE_SPEECH_-SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
CIRCUIT_MODE_DATA_SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
SCLNP_SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
CONP_SUPPORTED	TRUE	TRUE/FALSE	The value is used in Class Of MS
ADVANCED_LINK	TRUE	TRUE/FALSE	The value is used in Class Of MS
T.351	30	30 Sec.	Registration Timer
NOTE: For definition see ETS 300 392-1 [1], clause 7.			

6.2.3 Validation results

The results show that the MM protocol can function without changes needed in the PDUs and no normative errors were found. There are a few comments that could increase the readability of the MM protocol description in ETS 300 392-2 [2].

No.	MM 1	**Reference**	16.3.1.3.1	**Category**	Informative
Item					
In the MLE-Report-Indication coming from MLE, the Transfer Result parameter is stating the status whether the PDU has been sent or not.					
Validation decision					
The cancel operation is not part of the MM SDL model.					
NOTE:					

No.	MM 2	**Reference**	16.10.39	**Category**	Editorial
Item					
In table 201 the PDU Type element 0111 for Downlink is called D-LOCATION-UPDATE-RESULT Should be D-LOCATION-UPDATE-REJECT see table 154.					
Validation decision					
Not applicable					
NOTE:					

6.3 CONP entity

6.3.1 Validation purposes

The validation of the CONP has been done with the scope to validate the use of the TETRA Air-Interface and not the X.25 standard.

6.3.1.1 Data transfer

The following purposes are defined for handling data transfer:

1) set-up a virtual connection;

2) data;

3) clear a virtual connection.

6.3.2 Options, constants and parameters

Not applicable.

6.3.3 Validation results

The validation of the CONP is a validation of the use of the TETRA Air Interface. In this respect the validation shows some changes are needed.

No.	CONP 1	**Reference**	25.5	**Category**	Informative
Item					
The first paragraph "The protocol functions shall be (clause 24):", the meaning of this paragraph is unclear.					
Validation decision					
Not applicable					

No.	CONP 2	**Reference**	25.5	**Category**	Informative
Item					
The sentence "the messages sent by the Application may be eventually segmented in packets in three user data of 4 096 bytes maximum.", Why is the number of packets' three?					
Validation decision					
Not applicable					

No.	CONP 3	**Reference**	25.5, 21.2.3.5, A.2	**Category**	Informative
Item					
The CONP cannot use its maximum Service Data Unit (SDU) size of 4 096 octets. The maximum size of a TL-SDU is 4 096 octets (LLC parameter N.271). With the current LLC parameters, the length of the CONP SDU shall be reduced with the size of the Frame Check Sequence (FCS); if used; the MLE header and the CONP header. If the issue is to maintain the maximum SDU size of the CONP, then the overhead caused by the previous values should be added to N.271. This would also affect the N.271 transferred in AL-SETUP PDU parameters.					
Validation decision					
Values are used as they appear in the CONP and LLC specification and the CONP SDU size is reduced in the validation model.					

No.	CONP 4	**Reference**	25.6.1	**Category**	Informative
Item					
In this subclause some MLE-RESET primitives are shown, without any description of their use.					
Validation decision					
Not used in this SDL model.					

No.	CONP 5	**Reference**	25.6.2	**Category**	Informative
Item					
The meaning of the paragraph "Only mapping of priority is done on the air interface as defined in quality of service." is unclear. Even if the paragraph may imply the mapping of the priority value given in CONP Quality of Service (QoS) to CONP queuing priority, the value used for the PDU priority inside MS protocol stack remains unclear.					
Validation decision					
Not applicable					

No.	CONP 6	**Reference**	25.6	**Category**	Informative
Item					
It is not described which of the layer 2 services the CONP should use as described for the other layer 3 protocols as: acknowledged request, acknowledged response or unacknowledged.					
Validation decision					
The CONP always uses the acknowledged requests.					

No.	CONP 7	**Reference**	25.6.1	**Category**	Informative
Item					
It is stated that CONP should be able to receive the MLE-REPORT indication service primitive. No description is provided on how the protocol should react to the parameter value conveyed by the service primitive.					
Validation decision					
No reaction except for reception of the MLE-REPORT indication SP is specified in the validation model.					

6.4 SCLNP entity

6.4.1 Validation purposes

As SCLNP is a simplified protocol of ISO connectionless-mode network protocol, ISO.8648 [7], the validation has been concentrated on mapping the SCLNP Service Access Point (SAP) primitives to PDUs and vice versa. In addition to validating the service primitives the mapping with underlying MLE acting as a service provider is also validated.

Following validation cases have been made to validate MS SCLNP data transfer service:

1) receiving data packets from SwMI;

2) sending data packets to SwMI;

3) requesting and receiving delivery reports from SwMI.

6.4.2 Options, constants and parameters

Options, constants and parameters used in the validation in SCLNP are given in table 4.

Table 4: Constant and parameter values used in the validation of SCLNP

Name	Values used	Range	Remarks
SCLNP_RESENDS_AFTER_CLOSE	FALSE	TRUE..FALSE	Packet resending after MLE-CLOSE/OPEN pair
CURRENT_MNI	357 999	note	The Mobile Network Identity (MNI) of the current network (MCC, MNC)
TETRA_AIR_INTERFACE_STANDARD_VERSION_NUMBER	0	0-7	Used in PDU header
NOTE: For definition see ETS 300 392-1 [1], clause 7.			

6.4.3 Validation results

The results show that the SCLNP can function without structural changes needed in the PDUs. Major number of the reports indicate editorial changes to increase the readability of the textual description of SCLNP. In summary, a fully functional SCLNP can be constructed from the description in ETS 300 392-2 [2].

No.	SCLNP 1	**Reference**	26.2.3.1, 26.3.4.2, 27.5.2.4	**Category**	Normative
Item					
In subclause 26.2.3.1 the maximum length of NSDU is stated to be 2 048 octets. The minimum can be understood to be 0 since the NSDU and NSDU LENGTH parameters in TN-UNITDATA primitives in subclause 26.3.4.2, table 352 are marked as conditional. However, in subclause 27.5.2.4 the Packet length that should be same as NSDU LENGTH in corresponding primitive has been stated to have values from 1 to 2 048. It is not clear what is the Packet length value supposed to be in case NSDU and NSDU LENGTH parameters have been omitted in the corresponding TN-UNITDATA request primitive. To correct the situation it is possible to redefine the Packet length value range to start from 0 or redefine the NSDU and NSDU LENGTH parameters to be mandatory and redefine the NSDU LENGTH value range to be from 1 to 2 048.					
Validation decision					
The Packet length value range in PDUs is redefined to be 0 to 2 048.					

No.	SCLNP 2	**Reference**	27.4.2, 27.4.3	**Category**	Normative
Item					
In subclause 27.4.2, figure 167, and subclause 27.4.3, figure 168, downlink PDU S2-DT is stated to contain Delivery/Store request and Report request fields. These fields have no meaning to MS since there is no S1-DEL PDU to send any disposition reports to SwMI. In the same way as Multicast Area Selection field in S1-DT PDU is marked as Reserved in S2-DT PDU the Delivery/Store request and Report request fields should be marked as Reserved in S2-DT PDU too.					
Validation decision					
The information from S2-DT PDU Delivery/Store request and Report request fields are copied to corresponding service primitives. However, no other actions are taken by the MS SCLNP.					

No.	SCLNP 3	**Reference**	27.10.4	**Category**	Normative
Item					
In the algorithm for checking checksum parameters the initialization of checksum calculation variables C1 and C0 are incorrectly initialled to have the value of C0. Later in the calculation C0 is always set to value 0 and C1 to value C0. The (mod 255) note in the procedure C is not necessary.					
Validation decision					
The initialization of C1 and C0 is set to 0 (zero) as in subclause 27.10.3 procedure A. The checksum calculation syntax is corrected to be the same as in subclause 27.10.3 procedure B.					
NOTE: In the validation model Intersystem PDU handling has not been implemented in the BS SCLNP and thus the header checksum algorithm described in subclause 27.10 has not been implemented either.					

No.	SCLNP 4	**Reference**	18.3.5.3.1, 27.7.9.2	**Category**	Informative
Item					
In the subclause 18.3.5.3.1 it is stated about MLE handling of TL-DATA confirm and TL-DISCONNECT request primitives that "once TL-DATA confirm has been received and no further MLE-UNITDATA requests have been received from CONP or SCLNP, and the CONP/ SCLNP has no more data to send the MS-MLE may issue TL-DISCONNECT request primitive to the TLA SAP". This statement gives a possibility that SCLNP may have several MLE-UNITDATA requests pending in the MLE at the same time. It means that the buffering of requests is located in the MLE and no additional buffering in the SCLNP might be needed. In case the underlying MLE does not give immediate response (MLE-REPORT indication) containing the handle for MLE-UNITDATA request then SCLNP cannot have more than one outstanding data request at a time. In the validation model the MLE gives a MLE-REPORT indication after the data packet has been either successfully or unsuccessfully sent to SwMI. This indication contains a Handle parameter but SCLNP cannot use the information to connect the report to any earlier MLE-UNITDATA request because the Handle is given only in the MLE-REPORT indication itself. On the other hand, if buffering is implemented in SCLNP, as suggested in subclause 27.7.9.2, the possibility to send several MLE-UNITDATA requests in one connection becomes much more difficult. If buffering is done so that SCLNP will wait for MLE-REPORT indication to each MLE-UNITDATA request before sending new data to MLE the advanced link is opened and closed for each UNITDATA packet by MLE. This link open/close for each packet would mean extra air traffic.					
Validation decision					
No. buffering and therefore priority handling is implemented in the validation model of MS SCLNP.					
NOTE: In implementations of BS SCLNP the buffering may have real value but in the MS SCLNP it may only increase the air interface traffic if the buffering is very simple because of connect and disconnect packets for each data packet sent.					

No.	SCLNP 5	**Reference**	26.3.4.2, 27.5.4.4	**Category**	Informative
Item					
The REPORT REQUEST parameter as defined in subclause 27.5.4.4 is missing from the subclause 26.3.4.2 table 352 that describes TN-SCLNS SAP service primitives. Appearance of the REPORT REQUEST parameter should be conditional in TN-UNITDATA request and TN-UNITDATA confirm primitives.					
Validation decision					
The REPORT REQUEST parameter has been added into TN-UNITDATA request and confirms primitives as a conditional parameter.					

No.	SCLNP 6	**Reference**	26.3.4.2, 27.5.4.3	**Category**	Informative
Item					
The Multicast and Packet storage parameters listed in subclause 26.3.4.2 table 352 include the same information as Delivery/Store request parameter in the same facility's list. From subclause 27.5.4.3 it can be seen that the Delivery field acts like Multicast facility and that the Storage field acts like Packet storage facility.					
Validation decision					
The Multicast and Packet storage parameters have been removed from the facility list of TN-UNITDATA primitives. Only the Delivery/Store request parameter is used instead.					

No.	SCLNP 7	**Reference**	26.3.4.2, 27.4.2	**Category**	Informative
Item					
The Area Selection parameter in subclause 26.3.4.2 table 352 cannot be derived for TN-UNITDATA indication primitive. The corresponding S2-DT PDU as described in subclause 27.4.2 does not contain information to fill Area Selection parameter in the primitive.					
Validation decision					
The Area Selection primitive in TN-UNITDATA indication primitive has not been used.					

No.	SCLNP 8	**Reference**	17.3.6, 26.3.4.2	**Category**	Informative
Item					
The QoS parameter in subclause 26.3.4.2 table 352 cannot be derived for TN-UNITDATA-indication primitive. The corresponding MLE-UNITDATA indication primitive does not carry QoS value to SCLNP.					
Validation decision					
The QoS parameter in TN-UNITDATA indication parameter has not been used.					

No.	SCLNP 9	**Reference**	17.3.6, 26.3.4.2, 27.4.2	**Category**	Informative
Item					
The DESTINATION ADDRESS parameter in subclause 26.3.4.2 table 352 cannot be derived for TN-UNITDATA indication primitive. The corresponding S2-DT PDU as described in subclause 27.4.2 does not contain information to fill DESTINATION ADDRESS parameter in the primitive. Even though it is stated in the notes below PDU header structure figures in subclauses 27.4.2 and 27.4.3 that "MLE sublayer adds a source address parameter to the uplink PDU and adds a destination address parameter to the downlink PDU." This cannot be seen in subclause 17.3.6 primitive definitions. In TETRA MS the destination address in TN-UNITDATA indication is implicitly assumed to be equal to the MS itself. However, in TETRA BS the address information is needed when converting S2-DT PDU to S1-DT PDU.					
Validation decision					
The DESTINATION ADDRESS parameter in TN-UNITDATA indication primitive has not been used.					

No.	SCLNP 10	**Reference**	26.3.4.3, 27.4.5	**Category**	Informative
Item					
The Multicast facility in subclause 26.3.4.3 table 353 cannot be derived for TN-DELIVERY indication primitive. The corresponding S2-DEL PDU as described in subclause 27.4.5 does not contain information to fill Multicast facility in the primitive. Also, the Multicast facility has no real meaning for MS as it only receives TN-DELIVERY indications.					
Validation decision					
The Multicast facility in TN-DELIVERY indication primitive has not been used.					

No.	SCLNP 11	**Reference**	27.2.4.2, 27.7.7, 27.9	**Category**	Informative
Item					
In subclause 27.2.4.2 it is stated about fields that correspond to non-supported additional facilities that those fields should be ignored. On the other hand in subclause 27.7.7 in description about Discard PDU functionality it is stated that whole PDU should be discarded if a PDU is received which contains an unsupported facility.					
Validation decision					
There are only two sets of supported facilities. In SLIM protocol a subset of FULL protocol facilities is used. In subclause 27.9 about conformance it is stated that the implementation of FULL protocol is required to be conformant with the ETS 300 392-2 [2]. As a result there will never be unsupported facilities in SCLNP and therefore the discard of PDUs based on unsupported facilities is not required.					

No.	SCLNP 12	**Reference**	27.5.4.4, 27.5.4.5, 27.7.9.7	**Category**	Informative
Item					
In subclause 27.5.4.4 the 4th Report request bit is described to be reserved. However, in subclause 27.5.4.5 the 4th bit is described to be set for "error reports". In subclause 27.7.9.7 a direct match between REPORT REQUEST and REPORT CLASS fields is described.					
Validation decision					
The 4th bit in REPORT REQUEST has been taken as ERROR REPORT bit in REPORT CLASS field.					

No.	SCLNP 13	**Reference**	27.7.1.4	**Category**	Informative
Item					
The derivation of AREA SELECTION field is not listed in the list of facility fields to be derived from the corresponding TN-UNITDATA request primitive.					
Validation decision					
AREA SELECTION facility field is copied into Multicast Area Selection field in S1-DT PDU.					

No.	SCLNP 14	**Reference**	27.7.3, 27.7.4	**Category**	Informative
Item					
TIMESTAMP field is not listed in the list of facility fields to be copied into the corresponding TN-UNITDATA indication and into the corresponding TN-DELIVERY indication primitives.					
Validation decision					
TIMESTAMP facility field is copied from data PDU into the corresponding TN-UNITDATA indication primitive and from delivery PDU into the corresponding TN-DELIVERY indication primitive.					

No.	SCLNP 15	**Reference**	27.8.2	**Category**	Informative
Item					
In subclause 27.8.2 there is a decision information how to select "unacknowledged" or "acknowledged request" layer 2 service from MLE. In the second rule it is stated that a uplink or downlink primitive that indicate "class 2" in the QoS parameter may be mapped to "unacknowledged" service. The definition of "class 2" Quality of Service is unclear.					
Validation decision					
This rule has not been used in the validation mode.					

No.	SCLNP 16	**Reference**	18.3.5.2.1	**Category**	Editorial
Item					
In the subclause 18.3.5.2.1 it is stated about Busy state in MLE that MLE-BUSY or MLE-IDLE request can be received from SCLNP too. This is incorrect information, since the LSCL-SAP as noted in subclause 17.3.5 does not handle these primitives.					
Validation decision					
No MLE-BUSY or MLE-IDLE requests have been used in the validation model of SCLNP.					

No.	SCLNP 17	**Reference**	26.2.3.2	**Category**	Editorial
Item					
At the end of subclause 26.2.3.2 it is stated that "The details of the additional facilities offered by a given network can be negotiated and examined using the facility negotiation primitives". In SCLNP there are no distinct facility negotiation primitives. The only information that is given about supported facilities in each individual data packet is the PROTOCOL SUBSET parameter that tells whether the FULL or SLIM protocol is used.					
Validation decision					
This information has not been used.					

No.	SCLNP 18	**Reference**	26.3.2, 26.3.4.1	**Category**	Editorial
Item					
In subclause 26.3.2 it is stated about TN-UNITDATA confirm primitive: "It only confirms the successful transfer of the NSDU to the infrastructure". On the other hand in subclause 26.3.4.1 the TN-UNITDATA confirm parameter REPORT is described to have a Boolean value about success of a data transmission. From the current wording it can be understood that TN-UNITDATA confirm is allowed to be used only for positive reports. It should have been stated that if SCLNP service user gets a positive confirm it is only to confirm the successful transfer of the NSDU to the infrastructure.					
Validation decision					
The REPORT parameters in TN-UNITDATA confirm primitive is taken directly from corresponding MLE-REPORT indication primitive. That value can be either success or failure.					

No.	SCLNP 19	**Reference**	26.3.4.1, 27.2.3	**Category**	Editorial
Item					
In the destination and source address types are described in subclause 26.3.4.1 to have the value of ISSI or GSSI. However, ITSI or Group TETRA Subscriber Identity (GTSI) should be used instead since ISSI and GSSI address types do not contain country and network code in them. The address types used in PDUs are described in subclause 27.2.3 to be of type Short Subscriber Identity (SSI) or TSI.					
Validation decision					
The destination and source address types are used as ITSI and GTSI in TN-SCLNS SAP service primitives.					

No.	SCLNP 20	**Reference**	27.2.7	**Category**	Editorial
Item					
In subclause 27.2.7 the timer service in Lower Layer Management Entity (LLME) is presented. However, no need for timers or other services provided by LLME are referenced in any other part of clauses 26 or 27.					
Validation decision					
This information has been ignored.					

No.	SCLNP 21	**Reference**	27.3, 27.4.1	**Category**	Editorial
Item					
In subclause 27.3 table 354 the DELIVERY PDU data content has been marked as 'None'. Strictly speaking the data content actually contains up to two octets from the beginning of corresponding DATA PDU user data part. This has been correctly indicated in the subclause 27.4.1 table 356.					
Validation decision					
Does not affect the validation model.					

No.	SCLNP 22	**Reference**	27.4.1, 27.4.5	**Category**	Editorial
Item					
In subclause 27.4.1 table 356 the Destination Address field is marked as being a part of S2-DEL PDU. However, looking from subclause 27.4.5 only Source Address field should be existent.					
Validation decision					
Destination address has not been used in S2-DEL PDU.					

No.	SCLNP 23	**Reference**	27.5.2.3	**Category**	Editorial
Item					
In subclause 27.5.2.3 figure 176 the flag telling address being a LONG or SHORT is named as "LA". Later in the description the field name is referred as "LS". Everywhere else in the clause 27 the field is referred as "LA". Following the same naming convention as for FULL/SLIM PROTOCOL flag is "FS" this LONG/SHORT ADDRESS should be named "LS".					
Validation decision					
Does not affect the validation model.					

No.	SCLNP 24	**Reference**	27.5.4.5	**Category**	Editorial
Item					
The last sentence in the subclause 27.5.4.5 about disposition report generation only when a packet storage has been attempted is not connected to any particular disposition report. Now it is unclear to what report this text is connected.					
Validation decision					
The sentence should be a note connected to one of the disposition reports listed in the subclause. In the validation model the BS SCLNP does not contain any packet storage functionality and therefore the information in the end of subclause 27.5.4.5 makes no difference. The implemented BS SCLNP can give any kind of disposition report and the value is passed in the MS SCLNP to the service user.					

No.	SCLNP 25	**Reference**	27.5.6, 27.7.2	**Category**	Editorial
Item					
In subclauses 27.5.6 and 27.7.2 DELIVERY PDU is stated to contain all of the user data if the corresponding data PDU contains "less than 2 octets". This should be "less than or equal to 2 octets".					
Validation decision					
DELIVERY PDU contains up to 2 first octets of user data from the corresponding data PDU.					

No.	SCLNP 26	**Reference**	27.7	**Category**	Editorial
Item					
In subclause 27.7 table 357 the reference numbers are out of date. Also, it is not stated where these numbers refer to.					
Validation decision					
Reference numbers are changed, e.g. 10.1 to 27.7.1, 10.2 to 27.7.2, etc. which are subclauses in the ETS 300 392-2 [2].					

No.	SCLNP 27	**Reference**	27.7.1	**Category**	Editorial
Item					
In the subclause 27.7.1 it is stated that information to fill data PDU is taken from the associated TL-UNITDATA request primitive. This should be TN-UNITDATA request primitive.					
Validation decision					
Information is taken from TN-UNITDATA request primitive instead of TL-UNITDATA request primitive.					

No.	SCLNP 28	**Reference**	27.5.2.3, 27.7.1.3, 27.7.2.3	**Category**	Editorial
Item					
In subclause 27.5.2.3 FS FLAG is stated to have values FULL PROTOCOL = 0 and SLIM PROTOCOL = 1. Later in the subclause 27.7.1.3 it is stated that "If the facility fields contain valid information, this shall be indicated by setting the FS FLAG". Further on it is stated that "FS FLAG shall be cleared" in the meaning that FS FLAG should be set to a value indicating SLIM PROTOCOL. In the current wording it is not very clear whether "FS FLAG shall be set" and "FS FLAG shall be cleared" means the actual bit in the air interface PDU or something logical. In the subclause 27.7.2.3 there is a similar unclear sentence about "...by setting the FS FLAG".					
Validation decision					
The FS FLAG is set to indicate FULL PROTOCOL in the fist case and SLIM PROTOCOL in the latter case.					

No.	SCLNP 29	**Reference**	27.7.3, 27.7.4	**Category**	Editorial
Item					
In the subclauses 27.7.3 and 27.7.4 it is stated that "the current mobile network code shall be inserted to complete the source address parameter". The ITSI address type contains also MCC in addition to MNC so the MCC should be inserted too to complete the long address format.					
Validation decision					
MCC of the current network is also inserted into SCLNP service primitives where short address format is used in corresponding PDUs.					

No.	SCLNP 30	**Reference**	27.7.9.5	**Category**	Editorial
Item					
In the subclause 27.7.9.5 there is reference to subclause about AREA SELECTION field. This subclause number is out of date and should be updated to be 27.5.4.6 instead of being 27.5.4.5 as it is now.					
Validation decision					
Does not affect the validation model.					

6.5 MLE entity

6.5.1 Validation purposes

The validation purposes for the MLE entity are structured according to the functional entities of the MLE entity, i.e. validation cases for the Attachment entity, the Data transfer entity, the Network broadcast entity, and the Management entity.

6.5.1.1 Attachment management procedures

1) Activation;

2) deactivation;

3) undeclared cell re-selection;

4) unannounced cell re-selection;

5) announced type 3 cell re-selection;

6) announced type 2 cell re-selection;

7) announced type 1 cell re-selection;

8) scanning procedure;

9) monitoring procedure;

10) call restoration;

11) access handling to communication resources.

These validation purposes are applicable to LMM-SAP and where relevant also to LCMC-SAP, LCO-SAP and LSCL-SAP.

NOTE: Data transfer with Logical Link Control (LLC) is represented in these validation cases in an abstract manner, since the exact operation is described in corresponding validation cases for data transfer. Therefore, e.g. data sending is represented always with TL-DATA request primitive and data reception with TL-DATA indication primitive.

Validation cases 6 and 7 are applicable only if announced type 1 and announced type 2 cell re-selections and the D-NWRK-BROADCAST-PDU transmission are supported by SwMI.

6.5.1.2 Data transfer

1) Data transfer with MM and CMCE entities;

2) data transfer with CONP and SCLNP entities.

Validation case 1 is applicable to LMM-SAP and LCMC-SAP and validation case 2 to LCO-SAP and LSCL-SAP.

NOTE: MM and CMCE use L2 acknowledged BL service for data transfer except when the length of the SDU exceeds the limit of the Basic Link service. For CONP and SCLNP it is recommended to use the AL service although both services may be used. Therefore, validation case 2 contains only data transfer using L2 acknowledged advanced link and L2 unacknowledged basic link services. The functionality in using L2 acknowledged basic link services, for data transfer with CONP and SCLNP entities is similar to that described for MM and CMCE entities in validation case 1. Therefore the validation case 1 applies also for tracing the functionality of using acknowledged basic link for data transfer with CONP and SCLNP. Sending of acknowledged data response from CONP and SCLNP entities can only be performed via the basic link acknowledged service.

6.5.1.3 Network broadcast procedures

1) Broadcast information reception;

2) neighbour cell enquiry.

6.5.1.4 Management entity procedures

The functionality related to Management entity is outside the scope of the textual protocol specification and therefore outside the scope of validation.

6.5.2 Options, constants and parameters

Table 5: Constant and parameter values used in the validation of MLE

Name	Values used	Range	Remarks
T.370	5 sec.		Cell re-selection preparation response time
MAX_BL_SIZE	750		Selection criterion between Basic and Advanced Link (approximately 3 Time Division Multiple Access (TDMA) time slots worth of data)

6.5.3 Validation results

The MLE protocol description, as defined in ETS 300 392-2 [2], clause 18, functions after implementing the changes indicated below. In addition a number of changes are proposed to increase readability and remove spelling mistakes.

No.	MLE 1	**Reference**	18.4.1.4	**Category**	Normative
Item					
In the definition of the layout of the protocol PDUs of the MLE it is stated how the type 1 and type 2 elements shall be divided by an Optional Bit (O-bit). For the D-NWRK-BROADCAST PDU there is the field "Neighbour cell information" that is neither a type 1 nor type 2 field. For this field again it is indicated whether its fields are type 1 or type 2. However it is not stated explicitly whether for each "Neighbour cell information" element there shall again be an O-bit between the type 1 and type 2 elements in the PDU layout. How to encode the "Neighbour cell information" element should be made explicit.					
Validation decision					
In the validation model the O-bit is introduced in the "Neighbour cell information" element and used to indicate if there is any type 2 elements present.					

No.	MLE 2	**Reference**	18.3.4.7.6	**Category**	Normative
Item					
In subclause 18.3.4.7.6 Announced cell re-selection type 1 it is stated that if cell re-selection is not successful a D-PREPARE-FAIL PDU is received which shall carry a MM PDU. This PDU shall be passed to MM using the MLE-PREPARE confirm. However according to the D-PREPARE-FAIL PDU definition in 18.4.1.4.3, there is no field to carry the MM PDU (as an SDU field in the MLE PDU).					
Validation decision					
In the validation model it is chosen to introduce an SDU field in the MLE D-PREPARE-FAIL PDU, in the same way as for the D-NEW-CELL PDU. And so implement the specified protocol behaviour for the Cell re-selection. Hence the D-PREPARE-FAIL PDU definition in 18.4.1.4.3 is supposed to be updated to contain also an SDU field.					

No.	MLE 3	**Reference**	18.3.4.7.2	**Category**	Informative
Item					
The MLE Protocol description of the undeclared cell re-selection procedure specifies that the CONP entity may receive a MLE-REOPEN-indication service primitive when MM has performed successful registration. However according to clause 17 there is no MLE-REOPEN-indication service primitive defined for the CONP SAP.					
Validation decision					
The solution in the validation model is to send the MLE-OPEN-indication service primitive. This solution is supported also by the description of the MLE CONP service primitives in clause 17. Where it is stated that the MLE-OPEN-indication may be sent when MM has sent an MLE-OPEN request or a cell change has taken place.					

No.	MLE 4	**Reference**	18.3.5.2.1	**Category**	Informative
Item					
In subclause 18.3.5.2.1 c) it is stated that the MLE may receive an MLE-BUSY-request from MM, CONP and SCLNP. However according to clause 17 only the MM can send an MLE-BUSY-request. Furthermore it is stated that the number of MLE-BUSY-request should be counted and decreased for each MLE-IDLE-request received. However as only MM may send the MLE-BUSY and MLE-IDLE-requests then there is no need to have a counter.					
Validation decision					
In the validation model, only MM can change the state of the MLE.					

No.	MLE 5	**Reference**	18.3.6.5	**Category**	Informative
Item					
In subclause 18.3.6.5 it is stated: "The U-PREPARE PDU shall not contain an SDU or the following optional elements: mobile country code, mobile network code and location area." However the SDU field is not optional in the U-PREPARE PDU.					
Validation decision					
In the validation model the definition of U-PREPARE-PDU is implemented according to the definition in 18.4.1.4.6. That is only a Cell Identifier field is in the PDU and to model an empty SDU the SDU length indicator is set to 0.					

No.	MLE 6	**Reference**	18.4.1.4	**Category**	Informative
Item					
In the description of the MLE PDU structure it is stated that O-bit shall be present in every MLE PDU except for D-MLE SYNC and D-MLE SYSINFO. However it is not defined whether this O-bit shall occur before or after the SDU field that is used in some of the PDUs. It should be specified where O-bit shall be placed compared to the SDU field.					
Validation decision					
In the validation model the O-bit of the MLE PDUs is always placed before the SDU field.					

No.	MLE 7	**Reference**	18.3.5.3	**Category**	Informative
Item					
In subclause 18.3.5.3 a) the set-up of an advanced link is defined. However only the description of a successful Connect request, Connect confirms scenario is explained. In the LLC protocol subclause 22.2.2 a complete description of the possible responses to the Connect request is defined. For the MLE it is not defined how it should handle an unsuccessful advanced link set-up attempt. The MLE part should at least provide a reference to the more comprehensive description of the Advanced Link set-up procedure.					
Validation decision					
In the validation-model an unsuccessful Advanced Link set-up is defined as follows: If the length of the PDU allows it to be transferred via a Basic Link connection it is done so. If however the PDU is longer than what can be sent via the basic link a MLE-REPORT indication is sent to the MLE service user to indicate that the transfer has failed.					

No.	MLE 8	**Reference**	18.3.5.3	**Category**	Informative
Item					
In subclause 18.3.5.3 a) the Disconnection of an advanced link is defined. However it is not explicitly defined how the reception of an LLC Disconnect Indication is handled by the receiving MLE entity. Either it should be checked first if there are any on-going transmissions using the AL and if so wait for the corresponding confirm service primitives before removing the AL, or the AL may be removed immediately independent of the actual state.					
Validation decision					
In the validation model the immediate removal of the AL is used. This solution is chosen, as at the sending MLE entity the AL may already have been removed, before any of the transmitted PDUs are received at by the sending MLE entity.					

No.	MLE 9	**Reference**	18.3.4.5.7	**Category**	Informative
Item					
In subclause 18.3.4.5.7 the re-selection is defined to be initiated if "a neighbour cell is declared radio improvable". However only the serving cell is tested for the radio improvable property whenever a neighbour cell has been scanned or monitored. So it is assumed that the sentence in 18.3.4.5.7 should be "Cell re-selection shall be initiated if the serving cell is declared radio improvable...".					
Validation decision					
The validation model implements the rephrased description.					

No.	MLE 10	**Reference**	18.3.5.3.1	**Category**	Informative
Item					
For the outgoing messages from the CONP or SCLNP it is recommended that they use the Advanced Link service of the LLC. However as the MLE-UNITDATA-request specifies also the layer 2 service to be used, it may occur that "acknowledged response" is requested. However there is no Advanced Link TL-DATA response Service Primitive. So for this situation there is no possibility to perform the transmission in the specified way.					
Validation decision					
In the validation model the request for a response is sent as a new Advanced Link request using the established Advanced Link connection.					

No.	MLE 11	**Reference**	18.3.4.3	**Category**	Informative
Item					
The LLC service primitive TL-REPORT-indication at the TLC-SAP has a Report field that may be assigned the value: usage marker mismatch (20.3.5.4.5). However it is nowhere in the MLE protocol description explained how this value should affect the behaviour of the MLE. The other three possible report values all lead to a Radio Link failure.					
Validation decision					
In the validation model the execution is halted if this report value is received, i.e. no behaviour of the MLE is specified for the occurrence of this event.					

No.	MLE 12	**Reference**	18.3.5.3.1	**Category**	Informative
Item					
In subclause 18.3.5.3.1 a) and b) the message exchange for CONP and SCLNP entities is described. As they can use the un-acknowledged data transfer service the MLE should also be able to receive the BL and AL UNITDATA-confirm primitives from the LLC. However they are not mentioned in the MLE description and as it can be seen from the validation result LLC 15.					
Validation decision					
The LLC does not implement the LLC service primitives BL and AL UNITDATA-confirm as they should be replaced by the TLA REPORT indication, indicating the transfer result. Therefore the MLE does not either implement reception of BL or AL UNITDATA confirm primitives.					

No.	MLE 13	**Reference**	18.3.5.2.1	**Category**	Informative
Item					
In subclause 18.3.5.2.1 c) it is described that "...the MLE shall reject any group addressed channel change commands received from the MAC in a TL-SELECT indication." However the MLE only receives this signal when the channel change has taken place in the MAC. Furthermore, the description of the criterion for rejecting to perform the channel change is not clear. What is meant is that when an MLE entity receives a Service User PDU that is to be passed as a CMCE group addressed MLE-UNITDATA-indication with the Channel Change Request Response flag set and the Data Transfer entity being in state Busy the MLE discards the sending of that service primitive.					
Validation decision					
The effects of the MLE being in state Busy cause MLE-UNITDATA indications for the CMCE with the Channel Change Response Required flag set (TRUE) to be discarded, i.e. they are not transferred to the CMCE. This is so as the group call is anyhow no longer valid when the group move to another channel and this MS cannot at that moment perform the requested channel change.					

No.	MLE 14	**Reference**	18.3.4.7.4	**Category**	Informative
Item					
In the third note it is stated: The BS should not send D-NEW-CELL with "channel command valid" set equal to "no channel change.—However according to the previous paragraph this value can be used for the Announced cell re-selection type 3. The intended information in the note is that the value "Follow MAC channel change" cannot be used for type 3 re-selection, as it can be used only for type 1 and 2 re-selection.					
Validation decision					
Does not affect the validation model.					

No.	MLE 15	**Reference**	18.3.5.3.1	**Category**	Informative
Item					
In subclause 18.3.5.3.1 d) it is stated that "Late entry information from the D-MLE-SYSINFO PDU shall be routed to the CMCE SAP." However it is the D-MLE-SYNC PDU that can carry the late entry information. The correction assumed is to replace D-MLE-SYSINFO PDU with D-MLE-SYNC PDU.					
Validation decision					
Does not affect the validation model.					

No.	MLE 16	**Reference**	18.3.4.4	**Category**	Editorial
Item					
In NOTE: "...registration area is consists of..." the word "is" should be removed.					
Validation decision					
Does not affect the validation model.					

No.	MLE 17	**Reference**	18.3.4.7	**Category**	Editorial
Item					
In second paragraph it is stated "...criteria in subclause 18.3.4.7..". The reference refers to the section itself.					
Validation decision					
Does not affect the validation model.					

No.	MLE 18	**Reference**	18.3.4.7	**Category**	Editorial
Item					
In the third paragraph it is stated "...the initial cell selection procedures..." remove "s" from "procedures" as there is only one initial cell selection procedure defined.					
Validation decision					
Does not affect the validation model.					

No.	MLE 19	**Reference**	18.3.4.7	**Category**	Editorial
Item					
In the paragraph on Type 1 re-selection it is stated "...on the original cell directly the main control channel...". Add "to" like "...on the original cell directly to the main control channel...".					
Validation decision					
Does not affect the validation model.					

No.	MLE 20	**Reference**	18.3.4.7.1	**Category**	Editorial
Item					
In first paragraph: "These decision tree..." change "These" to "The"					
Validation decision					
Does not affect the validation model.					

No.	MLE 21	**Reference**	18.3.5.1.4	**Category**	Editorial
Item					
In second paragraph it is stated "...relating to a new calls,...". Remove "a"					
Validation decision					
Does not affect the validation model.					

No.	MLE 22	**Reference**	17.3.1	**Category**	Editorial
Item					
In the first paragraph it is stated "...should be as shown as follows:". Remove either "as shown" or "as follows".					
Validation decision					
Does not affect the validation model.					

No.	MLE 23	**Reference**	18.3.5.3.1 a)	**Category**	Informative
Item					
In the last paragraph of subclause 18.3.5.3.1 a) it is stated that MLE may receive MLE-CANCEL request SP from CONP and SCLNP. However, none of these protocols according to subclause 17.3.6 and subclause 17.3.8 can use the MLE-CANCEL request SP.					
Validation decision					
Does not affect the validation model.					

No.	MLE 24	**Reference**	18, 20.3.5.2	**Category**	Informative
Item					
The flow control service primitives FLOW-READY and FLOW-NOT-READY specified in subclause 20.3.5.2 do not appear in the MLE protocol description clause, clause 17.					
Validation decision					
The service primitives FLOW-READY and FLOW-NOT-READY are defined in the MLE validation model, but no cause for using these service primitives is defined.					

No.	MLE 25	**Reference**	17.3.1	**Category**	Informative
Item					
The state transition diagram in figure 61 indicates that MLE accepts MLE-BUSY request and MLE-IDLE request from MM only in state "All Data". However, MM may use these service primitives also during cell re-selection.					
Validation decision					
The MLE validation model accepts MLE-BUSY request and MLE-IDLE request during cell selection and cell re-selection procedures.					

No.	MLE 26	**Reference**	17.3.3	**Category**	Informative
Item					
The state transition diagram in figure 62 indicates that the MLE-CONFIGURE request service primitive can occur only in state "All Data". However, CMCE may send this SP also when MLE has sent MLE-BREAK indication, i.e. when the MLE is in state "Link Break".					
Validation decision					
The MLE validation model allows for reception of the MLE-CONFIGURE request service primitive also during cell re-selection.					

6.6 LLC entity

6.6.1 Validation purposes

The selection of validation cases is concentrated in the basic features in connection establishment, disconnection and data transfer via both links. The normal connection establishment is specified, however no concurrent services are validated.

Broadcast messages in TLB-SAP are outside the scope of the validation of LLC, since there is no functionality, neither the encoding/decoding is needed for the service primitives under this SAP inside the LLC.

For the same reason, the SPs in TLC-SAP are outside the scope.

The specification splits LLC into 2 link types - Basic and Advanced.

6.6.1.1 Basic link

The following cases are defined for the validation of basic link data transfer behaviour in LLC:

1) unacknowledged data reception;

2) unacknowledged data transmission;

3) acknowledged data reception;

4) acknowledged data transmission;

5) bi-directional acknowledged data transfer.

For better readability, stack internal signals MAC-READY and DATA-IN-BUFFER are presented in all MSCs only when they affect the immediately following protocol behaviour. Also, handshake with MAC for permission to send with these signals is outside the scope of the MSCs. Instead, data is sent directly to the MAC when appropriate for the BL protocol.

For the same reason signal TMA-REPORT indication is presented in diagrams only, when it may have an effect on the protocol behaviour, e.g. TMA-REPORT indication carrying handle for a BL-ACK - PDU is not shown in diagrams.

When the previously discussed three signals do appear in the diagrams, they are routed from BL protocol directly to MAC and vice versa, while in the actual validation model they are routed as two separate signals, each via the formatter process.

Assigning the TL-SDU - variables in the PDUs are not shown in the diagrams, unless necessary.

Signal BL-ACK has signal parameters in the diagrams only when the situation is exceptional and parameters are adequate to the protocol behaviour. The information content of a normal BL-ACK - PDU shown in the diagrams is the following:

- it carries no data;

- TL-SDU - the number it carries is the one the protocol expects to be received, i.e. N(R) = V(S).

In bi-directional acknowledged data transfer diagrams, only the expected protocol behaviour is shown due to the fact, that when receiving a BL-ADATA - PDU, the protocol acts like it after receiving a BL-ACK - PDU and followed immediately with BL-DATA. Thus, the correct behaviour for re-transmission and fault acknowledgement or data reception can be found in other diagrams describing the acknowledged data transfer.

6.6.1.2 Advanced link

The following cases are defined for the validation of advanced link connection establishment and disconnection in the LLC:

1) acknowledged advanced link incoming connection set-up;

2) acknowledged advanced link outgoing connection set-up;

3) acknowledged advanced link incoming disconnection;

4) acknowledged advanced link outgoing disconnection;

5) unacknowledged advanced link connection set-up;

6) unacknowledged advanced link disconnection.

Validation cases, where reports in AL-SET-UP and AL-DISC PDUs are shown, do not contain all possible report values, but the expected ones.

The following cases are defined for the validation of advanced link data transfer in LLC:

7) acknowledged data reception;

8) acknowledged data transmission;

9) peer-to-peer retransmission in acknowledged service;

10) peer-to-peer flow control in acknowledged service;

11) unacknowledged data reception.

For better readability, signals TMA-REPORT indication and TLA-REPORT indication are presented in diagrams only when they affect the current protocol behaviour. Instead, report handling between MLE and Advanced Link and Advanced Link and MAC is shown in a separate diagram inside validation case 8.

6.6.1.3 Common procedures to the LLC

The following cases are defined for the validation of common procedures for both link types in LLC:

1) cancellation of service primitives;

2) variable priority service primitives;

3) link releasing.

The validation model does not cancel an ongoing lower priority PDU-transmission in case of reception of a new emergency priority from the service user. Thus, it is outside the scope of the validation, and cancellation described in the MSCs concentrates only on the normal cancellation.

6.6.2 Options, constants and parameters

Options, constants and parameters used in the validation in LLC are given in the table 6.

Table 6: Options, constant and parameter values used in the validation of LLC

Name	Value used	Range	Applies to	Remarks
ADVANCED_LINK	TRUE	TRUE..FALSE	AL	Advanced link supported or not. This selection includes both AL services.
AL_UNACK_SETUP_ NEEDED	TRUE	TRUE	AL	Set-up is needed for the unacknowledged service.
UNSUPPORTED_ ADVANCED_LINK_ INDICATION	TRUE	TRUE..FALSE	AL	Indicates the unsupported AL in the set-up phase to the peer entity.
AL_UNACK_SUPPRESS RECEIVED_ DUPLICATES	TRUE	TRUE..FALSE	AL	Whether or not the correctly received SDUs are suppressed or re-sent to the service user in the unacknowledged service.
AL_UNACK_DATA_ DELIVERED_IN_ORDER	TRUE	TRUE..FALSE	AL	Whether or not the correctly received SDUs are sent to the service user in the correct order in the unacknowledged service.
PRIORITY_ORDERING	TRUE	TRUE	BL, AL	PDU-priority ordering of SDUs.
CANCEL_OPERATION	TRUE	TRUE	BL, AL	Cancel support.
PRE_EMPTIVE_ CANCEL	FALSE	FALSE	BL	Ongoing data transfer is not interrupted in BL in this case.
QUEUE_SIZE	8	1..n	BL, AL	Platform dependant maximum. Defines the maximum number of SDUs in any of the LLC instances buffers.
BL_FCS	TRUE	TRUE	BL	
BL_UNITDATA_ CONFIRM				See the LLC validation results.
MAX_CONCURRENT_ LINKS	1	1	BL, AL	Concurrent links are not supported.
T.251	4	-	BL	Sender retry timer in BL.
T.252	9	-	AL	Acknowledgement waiting timer.
T.261	4	-	AL	Set-up waiting timer.
T.263	4	-	AL	Disconnection waiting timer.
T.271	36	-	AL	Receiver not ready validity timer for the data sending entity.
T.272	18	-	AL	Receiver not ready validity timer for the data receiving entity.
N.251	2595 bits	.. 2595 bits	BL	Maximum length of TL-SDU.
N.252	1, 3	1..5, 3..5 (note)	BL	Maximum number of TL-SDU re-transmissions for acknowledged service.
N.253	1	1..5	BL	Maximum number of TL-SDU repetitions in unacknowledged service.

(continued)

Table 6 (concluded): Options, constant and parameter values used in the validation of LLC

N.262	3	1..5	AL	Maximum number of connection set-up retries.
N.263	3	3..5	AL	Maximum number of disconnection retries.
N.271	4 096 octets	..4 096 octets	AL	Maximum length of TL-SDU.
N.272	3	1..3	AL	Window size for TL-SDU in acknowledged service.
N.273	3	0..7	AL	Maximum number of TL-SDU re-transmissions.
N.274	3	0..15	AL	Maximum number of segment re-transmissions.
N.281	3	1..3	AL	Window size for TL-SDU in unacknowledged service.
N.282	1	0..7	AL	Number of repetitions for unacknowledged information.
NOTE: For parameter N.252 the value can change at run-time depending on the stealing repeats flag in the SP under transmission.				

6.6.3 Validation results

The validation of the LLC has shown that the protocol specification is functional without changes needed in the LLC PDUs. However, a number of changes are proposed to make the specification more consistent.

No.	LLC 1	**Reference**	21.2.3.1	**Category**	Normative
Item					
In the description of the AL-ACK structure it is mentioned, that the optional acknowledgement blocks may be repeated up to the window size N.272 in addition to the first mandatory acknowledgement block, when it is obvious that the amount of all acknowledgement blocks together should be the number of SDUs in the window.					
Validation decision					
AL-ACK contains acknowledgement blocks up to the number of the SDUs in the window.					

No.	LLC 2	**Reference**	21.2.3.1	**Category**	Normative
Item					
It is stated in the subclause "... by the acknowledgement bit map set to 111111_2 binary". The correct interpretation is obviously: ... by the acknowledgement length set to 111111_2 binary.					
Validation decision					
The validation follows the latter interpretation.					

No.	LLC 3	**Reference**	21.2.3.5, 21.2.3.4	**Category**	Normative
Item					
The usage of advanced link number field in the AL-SETUP and AL-DISC PDUs is not described in the protocol.					
Validation decision					
The link number is not used in the validation model.					

No.	LLC 4	**Reference**	22.3.3.1.2	**Category**	Normative
Item					
The protocol actions taken in case of a transmission failure of an AL-ACK or AL-RNR - PDU are not defined.					
Validation decision					
No action is taken in that case.					

No.	LLC 5	**Reference**	22.3.3.2.5	**Category**	Normative
Item					
The usage of timer T.272, Receiver not ready validity timer for the data receiving entity is not clearly defined in the procedures for the acknowledged AL, while the timer is defined in the normative annex A of the ETS 300 392-2 [2].					
Validation decision					
The timer is used as described in the corresponding validation cases for advanced link, figures 142 and 143 in this document.					

No.	LLC 6	**Reference**	20.2.4.2.4, 22.3.	**Category**	Informative
Item					
In the first reference given, the PDU priority ordering in the LLC is indicated to be an optional feature, while throughout the LLC procedures, the latter reference, PDU priority ordering is considered a mandatory feature.					
Validation decision					
PDU priority ordering is considered as an optional feature in the validation.					
NOTE: Applies to all LLC data sending entities.					

No.	LLC 7	**Reference**	20.3.5.1.1, 20.3.5.1.7	**Category**	Informative
Item					
The Endpoint Identifier should be part of the parameters in CANCEL request and REPORT indication primitives in TLA- and TMA-SAPs in addition to Handle, unless the EI is thought to be included in the Handle. The Handle is meant to define the message explicitly (which must mean, that the link is also defined). On the other hand, Endpoint Identifier is mentioned in other service primitives through the whole clause 20, so leaving it out of these primitives seems to be inconsistent.					
Validation decision					
The EI is included in the Handle.					
NOTE: Applies to all LLC instances sending service user data.					

No.	LLC 8	**Reference**	20.3.5.1.2, 20.3.5.1.5	**Category**	Informative
Item					
The advanced link service (acknowledged, unacknowledged) should be indicated to the service user in TL-CONNECT indication and confirm and in TL-DISCONNECT indication and confirm primitives.					
Validation decision					
The field is added to these SPs.					
NOTE: The usage of the service type indication in TL-CONNECT confirm and TL-DISCONNECT confirm primitives applies only to the BS side of the protocol.					

No.	LLC 9	**Reference**	20.3.5.1.2, 20.3.5.1.5	**Category**	Informative
Item					
The service user should be able to select the advanced link service (acknowledged, unacknowledged) in TL-CONNECT request and TL-DISCONNECT request primitives.					
Validation decision					
The field is added to the SPs. Applies only to the BS side of the protocol.					
NOTE: Applies only to the BS side of the protocol.					

No.	LLC 10	**Reference**	20.3.5.1.2	**Category**	Informative
Item					
The usage of the report field in TL-CONNECT primitive for the advanced link is not described in the specification.					
Validation decision					
The report field is not used in the validation.					

No.	LLC 11	**Reference**	20.3.5.1.3, 20.3.5.1.4	**Category**	Informative
Item					
The purpose of mandatory report field in TL-DATA confirm primitive is not described in the specification and no obvious purpose for these fields can be derived from the text related to the usage of these service primitives.					
Validation decision					
Report field is not used in the validation.					
NOTE: Applies to both BL and AL.					

No.	LLC 12	**Reference**	20.3.5.1.3, 20.3.5.1.4	**Category**	Informative
Item					
The parameters of TL-DATA confirm should include the handle in order for MLE to know which TL-DATA-request that is confirmed.					
Validation decision					
The handle is included in the parameters.					
NOTE: Applies to both BL and AL.					

No.	LLC 13	**Reference**	20.3.5.1.5	**Category**	Informative
Item					
The usage of the report field in TL-DISCONNECT request primitive for advanced link is not described in the specification.					
Validation decision					
The report field is not used in the validation.					

No.	LLC 14	**Reference**	20.3.5.1.7, 20.3.5.4.5, 22.1.2	**Category**	Informative
Item					
There are two service primitives named TL-REPORT indication on TLA-SAP and TLC-SAP, with different meaning and parameters. This is against the SDL syntax and semantics. This is also reflected in figures 101 and 102.					
Validation decision					
The solution for validation is to define all the signal names with the same convention as used for TM*-SAPs, like TLA-DATA request and TLC-REPORT indication. This also improves the readability.					

No.	LLC 15	**Reference**	20.3.5.1.8, 20.3.5.1.7	**Category**	Informative
Item					
There are two ways to tell the service user the result of a data transmission over the air; optional TL-UNITDATA confirm and TL-REPORT indication. One should be enough. In addition to that, TL-UNITDATA confirm primitive is not mentioned in the MLE part of the specification.					
Validation decision					
TL-UNITDATA confirm - primitive is not used at all.					
NOTE: Applies to both BL and AL.					

No.	LLC 16	**Reference**	20.3.5.1.8	**Category**	Informative
Item					
The purpose of conditional report field in TL-UNITDATA primitive is undefined. No obvious purpose for this field can be derived from the text related to the usage of this service primitive.					
Validation decision					
Report field is not used in the validation.					
NOTE: Applies to both BL and AL.					

No.	LLC 17	**Reference**	20.3.5.1.8	**Category**	Informative
Item					
The Endpoint Identifier is a conditional field in the TL-UNITDATA request in the advanced link, but it is not described in the LLC part of the specification, what to do with such a request, if the EI is not present. No obvious way of handling it can be derived from the text.					
Validation decision					
Endpoint Identifier is a mandatory field in the TL-UNITDATA request.					
NOTE: Apply only to the BS side of the AL.					

No.	LLC 18	**Reference**	22.2.2.1, 22.3.3.1.1	**Category**	Informative
Item					
In the procedures of the LLC considering the reception of an AL-SETUP PDU for the set-up phase sending entity, the TL-CONNECT indication and the possible service users response to that are missing, while they appear in the pictures describing the set-up phase in the corresponding protocol specification. Instead, the operation described in the procedures part is the special option, when the QoS negotiation is done between the LLC peer entities.					
Validation decision					
In the validation model, the TL-CONNECT indication in this case is passed to the MLE and the LLC continues by moving to WAIT IN CONNECT - state.					

No.	LLC 19	**Reference**	22.2.2.2	**Category**	Informative
Item					
In the unacknowledged advanced link description, the second TL-CONNECT indication given to the service user in the figure 121 should be removed or put into brackets. This is because, according to the textual specification, the link is created, when the AL-SETUP is correctly received for the first time and the information about that is already given to the service user.					
Validation decision					
The further connection attempts for the same link are not passed to the service user unless the parameters in the following AL-SETUP PDUs changes.					

No.	LLC 20	**Reference**	22.2.2.2, 22.2.2.10	**Category**	Informative
Item					
The description for data transfer state in the unacknowledged advanced link is inconsistent. According to the text for the set-up, the unacknowledged AL may start receiving data if it receives a suitable AL-SETUP PDU or it knows the allocated resource by other means. According to the text for the disconnection, the unacknowledged AL does not support any data transfer after the reception of an AL-DISC. Again, according to the set-up phase, this link might start the data reception immediately after a reception of the next suitable PDU carrying data. It should be clearly stated whether or not the data transmission may start again after the reception of an AL-DISC PDU or if there should be options in the text for the selection of the functionality.					
Validation decision					
In the validation model the set-up is needed before data transfer may commence successfully.					

No.	LLC 21	**Reference**	22.2.2.3	**Category**	Informative
Item					
Only one TL-DATA confirm is delivered to the MLE to confirm two separate TL-SDUs transferred in the figure 124. This is inconsistent with the text following the figure.					
Validation decision					
One TL-DATA confirm is delivered to the service user for each successfully delivered TL-SDU.					

No.	LLC 22	**Reference**	22.2.2.10	**Category**	Informative
Item					
In the unacknowledged advanced link description, the second TL-DISCONNECT indication given to the service user in the figure 137 should be removed or put into brackets. This is because, according to the textual specification, the link is removed, when the AL-DISC is correctly received for the first time and the information about that is already given to the service user.					
Validation decision					
The further disconnection attempts for the same link are not passed to the service user.					

No.	LLC 23	**Reference**	22.3, 23.1.2.1.1	**Category**	Informative
Item					
Report - First complete transmission by random access - is not mentioned in the LLC procedures for data transfer. Since, according to the MAC clause, it may be received and thus it should be mentioned also in the procedures.					
Validation decision					
This particular report is not used at all.					
NOTE: Applies to all LLC instances sending service user data.					

No.	LLC 24	**Reference**	22.3.2.3	**Category**	Informative
Item					
In the procedures for the acknowledged data transmission in basic link, paragraph g). It is described, that when this protocol instance receives a TMA-REPORT indication, with report set to random access failure due to a PDU that contained service user data, it should send a TL-REPORT indication up to the service user with the report failed transfer. The definition of a PDU containing service user data includes in this case also the BL-ACK PDU. However, the handle is not given to the MLE issuing a TL-DATA response, when the data included in it is sent with the BL-ACK (paragraphs b) and c)). Therefore, any further reports cannot be sent referring the previous transmission request in this case. Also, in the same procedures (paragraph e)), it has been defined, that LLC does not even recognize the TMA-REPORT indication, since it does not remember the handle for a BL-ACK issued to the MAC. Also in the next paragraph, h), it has been described, that if a BL-ACK transmission is failed due to a fragmentation failure, the optional data is discarded and no report is given to the service user. Anyhow, this particular report does not have any proper meaning to the service user, since the data may be lost on the radio path as well, and it cannot be re-transmitted according to the protocol description. On the contrary, the peer entity should re-transmit the data, if it does not receive an acknowledgement - which would then lead to a second acknowledgement sending.					
Validation decision					
No report indication is given to the service user in this case.					
NOTE: This functionality has some importance in CMCE and MM (see the corresponding validation results). Where the duplicates of the PDUs carried by the second DATA indication (due to a missed acknowledgement), should be considered in the protocol description.					

No.	LLC 25	**Reference**	22.3.2.3, 21.2.2.1	**Category**	Informative
Item					
In the procedures for the acknowledged data transmission in basic link, paragraph j), it is described, that when this protocol instance receives a BL-ACK containing data, it should send it in any case to the service user. However, the FCS calculation should be mentioned here, since it is mentioned in other parts of these procedures describing data reception. If the data is not meant to be checked, a clear distinction should be made in the text to pass the FCS checking in this case.					
Validation decision					
Data is always checked in order to deliver it to the MLE, in case the optional FCS is used.					

No.	LLC 26	**Reference**	22.3.3.1	**Category**	Informative
Item					
The protocol actions taken in case of report: fragmentation failure from MAC in TMA-REPORT indication are not described for the advanced link or the connection establishment or disconnection phases of the AL. Since the MAC does not make any difference between BL and AL SDUs, the action should be mentioned, even if this particular report should not appear as a response to the AL requests. Especially applicable this is to the AL-SETUP and AL-DISC PDU-sending that are comparable to the BL PDUs in this sense.					
Validation decision					
No action is taken in case of reception this report in AL.					

No.	LLC 27	**Reference**	22.3.3.2.6	**Category**	Informative
Item					
It is not described, when to update the transmission window for the acknowledged AL sending entity.					
Validation decision					
Window is updated when the lowest SDU in the current window is completely acknowledged.					

No.	LLC 28	**Reference**	22.3.3.2.7	**Category**	Informative
Item					
In the acknowledged AL data receiving entity description it is stated, that the lower window boundary should be updated in the certain situation, but the corresponding description for the high window boundary is missing.					
Validation decision					
Both window boundaries are updated at the same time.					

No.	LLC 29	**Reference**	22.3.3.4	**Category**	Informative
Item					
The abnormal release of the Advanced Link is defined to be informed to the service user using the TL-DISCONNECT indication primitive, while we already have the TL-RELEASE indication primitive for this purpose.					
Validation decision					
TL-RELEASE indication is used in the validation.					

No.	LLC 30	**Reference**	22.1.2	**Category**	Editorial
Item					
In figure 102, there are presented some dynamic protocol instances of LLC sub-entities, but the creation routes for those are missing.					
Validation decision					
Does not affect the validation model in terms of protocol functionality.					

No.	LLC 31	**Reference**	20.3.5.1.2, 22.2.2.1	**Category**	Editorial
Item					
Figures 115 and 118 in subclause 22.2.2.1 should be updated according to the description given in subclause 20.3.5.1.2, where it is described, that when service user is proposing a new QoS value, primitive TL-CONNECT response should be used instead of TL-CONNECT request. The definition of the TL-CONNECT confirm in subclause 20.3.5.1.2 should also be clarified to include that, this primitive should also be given to the service user as a result of a connection set-up phase when a TL-CONNECT response with modified QoS value is used.					
Validation decision					
Does not affect the validation.					

No.	LLC 32	**Reference**	22.3.3.1.1, 21.2.3.4	**Category**	Editorial
Item					
The report name "service temporarily not available" is used in the first given clause, while the definition for that report in the PDU is "Service temporarily unavailable" given in the latter clause referenced.					
Validation decision					
Does not affect the validation.					

No.	LLC 33	**Reference**	22.3.3.2.3	**Category**	Editorial
Item					
It is stated: "iii) if the receiver selectively acknowledges segments of a PDU then;", while the correct interpretation obviously is to use the word SDU instead of PDU.					
Validation decision					
Does not affect the validation.					

No.	LLC 34	**Reference**	22.3.3.2.6	**Category**	Editorial
Item					
It is stated in the given clause: "- if there no segments ...", while there is obviously the word: is, missing between the words there and no.					
Validation decision					
Does not affect the validation.					

No.	LLC 35	**Reference**	22.3.3.2.7	**Category**	Editorial
Item					
It is stated: "... then the LLC shall discard that PDU and mark that it needs to be re-transmitted ", while the correct interpretation obviously is to use the word SDU instead of PDU.					
Validation decision					
Does not affect the validation.					

6.7 MAC entity

The SDL model of the MAC is a model of the Upper MAC with scope on the protocol behaviour and synchronization. The protocol timing and the radio aspect are left out.

6.7.1 Validation purposes

The validation purposes for MAC are divided into two groups "synchronization" and "data transfer".

6.7.1.1 Synchronization

The following purposes are defined for handling synchronization:

1) synchronization;

2) scanning.

6.7.1.2 Data transfer

The following purposes are defined for handling data transfer:

1) address management;

2) transmitting data;

3) receiving data.

6.7.2 Options, constants and parameters

Table 7: Options, constant and parameter values used in the validation of MAC

Name	Value used	Range	Remarks
T.201	30 multiframes	-	Event label inactivity time-out
T.202	9 frames	-	Fragmentation time-out
T.205	5 multiframes	5..60	Random access time-out
T.206	18 frames	≥ T_202	Reserved access waiting time-out
T.208	30 multiframes	-	Inactivity time-out on assigned SCCH
T.209	18 multiframes	-	Inactivity time-out on traffic channel
T.210	18 TDMA frames	-	Timer for returning energy economy mode
T.211	36 TDMA frames	-	AACH time-out for transmission of TCH
T.212	18 TDMA frames	-	AACH time-out for reception of TCH
T.213	18 TDMA frames	-	DTX timer
T.214	6 frames	-	Stealing timer
N.202	2 632 bits	-	Maximum size of TM-SDU
N.208	3	-	Number of wrong AACHs to leave assigned channel
N.210	4	-	Quality threshold for serving cell
N.211	3	-	Number of invalid AACHs to stop transmission of TCH
N.212	3	-	Number of invalid AACHs to stop reception of TCH
N.213	3	-	Number of valid AACHs to allow reception of TCH
N.214	4	-	Number of transmissions if stealing repeats flag is set
NOTE: Due to the fact, that the MAC validation is not comprehensively concerned with all the protocol timing and radio aspects, not all of the values given in this table are used in the validation model. However, since these figures reflect some of the requirements set for the MAC validation model, they are presented here for information.			

6.7.3 Validation results

The scope of the MAC validation is validating the protocol behaviour, and confirming the functionality of the MAC .

No	MAC 1	**Reference**	23	**Category**	Editorial
Item					
The use of the word "channel" is ambiguous, sometimes it means a physical frequency and sometimes it means a logical name.					
Validation decision					
NA.					
NOTE:					

7 Protocol stack validation

7.1 Validation purposes

The selection of the stack validation purposes is done using the core functionality of the whole protocol stack. The idea is not to re-validate all the features in the individual protocols, but to ensure the inter-layer communication.

The protocol stack validation is done producing validation traces for the following validation purposes:

Registration:

1) activation;

2) MLE initiated registration;

3) user initiated registration;

4) network initiated registration;

5) de-registration;

6) energy economy mode;

7) enable - disable;

8) attachment - detachment of group identities.

Individual call:

1) individual call set-up using on/off hook signalling;

2) individual call set-up using direct set-up signalling;

3) call status information;

4) colliding calls;

5) call rejection.

Group call:

1) incoming call;

2) outgoing call;

3) call maintenance procedures;

4) call restoration;

5) call disconnect;

6) colliding calls;

7) call rejection.

Short Data Services (SDS):

1) incoming short data message;

2) outgoing short data message.

Connectionless data:

1) basic data transfer;

2) delivery report.

Connection oriented data:

1) virtual call set-up and clearing;

2) data transfer.

The actual validation traces for each validation purpose may comprise of more than one MSC-diagram.

The validation traces are present on the diskette attached to this ETR. See Annex B for the files included.

7.2 Options, constants and parameters

The stack validation is performed using the same option settings, timer values and constant values as for each individual protocol as described in the previous clauses.

7.3 Validation results

The validation results for the protocol stack validation are described among the ones for the individual protocol validation in the corresponding subclauses 6.1.3, 6.2.3, 6.3.3, 6.4.3, 6.5.3, 6.6.3 and 6.7.3.

7.4 Validation result summary

The number of validation results found in each of the individual protocols and the protocol stack validation is shown in table 8.

Table 8: Number of validation results

Entity	Normative	Informative	Editorial	Total
CMCE	0	13	1	14
MM	0	1	1	2
CONP	0	7	0	7
SCLNP	3	12	15	30
MLE	2	17	7	26
LLC	5	24	6	35
MAC	0	0	1	1
Total	10	74	31	115

Annex A: Validation cases for protocol entity validation

The content of this annex is contained in a compressed archive file (2931_r1.lzh) which accompanies this ETR. The file contains the MSCs used for the protocol entity validation.

Annex B: Validation traces for protocol stack validation

The protocol stack validation traces are included in a compressed archive file (2931_r1.lzh) which accompanies this ETR. The validation traces are released in two formats (organized in two distinct directories) as follows:

1) MSC textual format; MPR: tvdvtras

2) PostScript-format: tvdvtrap

Unpacking will produce the following set of files:

Registration:

Activation	ractivat.ps
MLE initiated registration:	
Roaming registration	rmleroam.ps
Migration registration	rmlemigr.ps
Forward registration	rmleforw.ps
User initiated registration:	
No new ITSI	ruirnone.ps
New ITSI	ruirnew.ps
Network initiated registration:	
Enabled registration	rnirenr.ps
Disabled registration	rnirdisr.ps
De-registration	rnirder.ps
Energy economy mode	rnireem.ps
Enable - disable:	
Temporary disable	redtmpd.ps
Permanent disable	redprmd.ps
Attachment - detachment of group identities:	
User Attachment - detachment of group identities	radusera.ps
Network Attachment - detachment of group identities	radnwrka.ps

Individual call:

Individual call set-up using on/off hook signalling:	
Incoming call	iconoffi.ps
Outgoing call	iconoffo.ps
Individual call set-up using direct set-up signalling:	
Incoming call	icdirsi.ps
Outgoing call	icdirso.ps
Transmission control	ictransm.ps
Call status information:	
Call modification	csicmod.ps
Call restoration	csicrest.ps

Call disconnect	csicdisc.ps
Colliding calls	csiccoll.ps
Call rejection	csicrej.ps

Group call:

Incoming call	gci.ps
Outgoing call	gco.ps

Call Maintenance procedures:

Transmission control	gctransm.ps
Call status information	gccstati.ps
Call modification	gccmod.ps
Call restoration	gccrest.ps
Call disconnect	gccdisc.ps
Colliding calls	gcccoll.ps
Call rejection	gccrej.ps

Short data services:

Incoming short data message:

User defined message	sdsincu.ps
Pre-defined message	sdsincp.ps

Outgoing short data message:

User defined message	sdsoutgu.ps
Pre-defined message	sdsoutgp.ps

Connectionless data:

Basic data transfer	cnlsdbd.ps
Delivery report	cnlsddr.ps

Connection oriented data:

Virtual call set-up and clearing	conpcsc.ps
Data transfer	conpdt.ps

NOTE 1: The MPR-format of the MSC-diagrams is compliant with the ITU-T Recommendation Z.120 [4].

NOTE 2: The textual MSC-files have extension .mpr, while extension .ps is used for the validation traces in PostScript-format.

NOTE 3: The .ps-files can be printed using a PostScript printer.

Annex C: Validation model

The validation model for the MS is included in a compressed archive file (2931_r1.lzh) which accompanies this ETR. Unpacking will produce one PostScript file "tetrav.ps" that can be printed using a PostScript printer.

History

Document history	
February 1997	First Edition

ISBN 2-7437-0676-7
Dépôt légal : Février 1997