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**Broadband Radio Access Networks (BRAN);
High Performance Radio Local Area Network (HIPERLAN)
Type 1;
Conformance testing specification;
Part 4: Abstract Test Suite (ATS) specification**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the ETSI Project Broadband Radio Access Networks (BRAN) of the European Telecommunications Standards Institute (ETSI).

This ETS consists of 4 parts as follows:

- Part 1: "Radio type approval and Radio Frequency (RF) conformance test specification";
- Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification";
- Part 3: "Test Suite Structure and Test Purposes (TSS&TP) specification";
- Part 4: "Abstract Test Suite (ATS) specification".**

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1 Scope

This European Telecommunication Standard (ETS) specifies the Abstract Test Suite (ATS) for the Medium Access Control (MAC) and Channel Access Control (CAC) protocol parts of the High Performance Radio Local Area Network (HIPERLAN) Type 1 functional specification as specified in ETS 300 652 [1].

ETS 300 836-3 [8] specifies the Test Suite Structure and Test Purposes (TSS&TP) related to this ATS specification.

In this ETS, the term "HIPERLAN" is used to refer to HIPERLAN, Type 1.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ETS 300 652 (1996) + prA1 (1996): "Radio Equipment and Systems (RES); High Performance Radio Local Area Network (HIPERLAN); Type 1; Functional specification".
- [2] ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
- [3] ISO/IEC 9646-2 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".
- [4] ISO/IEC 9646-3 (1992): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)" (including Amendment 1 and Amendment 2).
- [5] ISO/IEC 9646-4 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 4: Test realization".
- [6] ISO/IEC 9646-5 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 5: Requirements on test laboratories and clients for the conformance assessment process".
- [7] ETS 300 836-2: "Radio Equipment and Systems (RES); High Performance Radio Local Area Network (HIPERLAN) Type 1; Conformance testing specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [8] ETS 300 836-3: "Radio Equipment and Systems (RES); High Performance Radio Local Area Network (HIPERLAN) Type 1; Conformance testing specification; Part 3: Test Suite Structure and Test Purposes (TSS&TP) specification".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply, in addition to those given in ETS 300 652 [1]:

Abstract Test Suite (ATS): See ISO/IEC 9646-1 [2].

Implementation Under Test (IUT): See ISO/IEC 9646-1 [2].

Lower Tester (LT): See ISO/IEC 9646-1 [2].

Protocol Implementation Conformance Statement (PICS) proforma: See ISO/IEC 9646-1 [2].

Protocol Implementation eXtra Information for Testing (PIXIT) proforma: See ISO/IEC 9646-1 [2].

Point of Control and Observation (PCO): See ISO/IEC 9646-1 [2].

Protocol Implementation Conformance Statement (PICS): See ISO/IEC 9646-1 [2].

Protocol Implementation Extra Information For Testing (PIXIT): See ISO/IEC 9646-1 [2].

System Under Test (SUT): See ISO/IEC 9646-1 [2].

Upper Tester (UT): See ISO/IEC 9646-1 [2].

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply, in addition to those given in ETS 300 652 [1]:

ASP	Abstract Service Primitive
ATM	Abstract Test Method
ATS	Abstract Test Suite
CAC	Channel Access Control
ExTS	Executable Test Suite
HCPDU	HIPERLAN CAC Protocol Data Unit
HEU	HIPERLAN Enhancement Unit
HIPERLAN	High PErformance Radio Local Area Network
IUT	Implementation Under Test
LT	Lower Tester
MAC	Medium Access Control
MOT	Means of Testing
PCO	Point of Control and Observation
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
SUT	System Under Test
TMP	Test Management Protocol
TMPDU	Test Management Protocol Data Unit
TP	Test Purpose
TSS&TP	Test Suite Structure and Test Purposes
TTCN	Tree and Tabular Combined Notation
UT	Upper Tester

4 Abstract Test Method (ATM)

4.1 ATM for MAC protocol

There are two different ATMs supported by the MAC ATS:

- co-ordinated test method;
- remote test method.

4.1.1 Co-ordinated test method

In this ATM there is an UT which communicates with the LT by means of a Test Management Protocol (TMP). The UT can send Protocol and Data Units (PDU) and examine the content of received PDUs. There is one Point of Control and Observation (PCO). This is in the test system at the upper boundary of the CAC (PCO-L) above which is the LT. The boundary between the IUT and the UT is not considered a PCO.

The test events at PCO-L are specified in terms of HCS-primitives, HMPDUs and Test Management PDUs (TMPDUs). The behaviour at the upper boundary of the IUT is not explicitly described in test cases; it is defined in the definition of the TMP which is implemented in the upper tester. The TMP is specified in annex A.

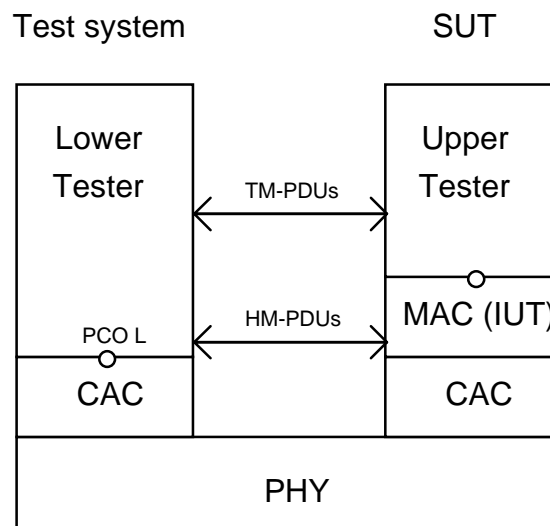


Figure 1: Co-ordinated test method

4.1.2 Remote test method

In this ATM there is no special UT, the layer(s) in the SUT above the IUT may be considered as a notional upper tester. There is only one PCO. This is at the upper boundary of the CAC in the test system (PCO-L) above which is the lower tester. There is no PCO at the upper boundary of the IUT and no observation is possible at that point. It is however possible to control the IUT although this is specified by informal means (i.e. implicit sends).

The test events at PCO-L are specified in terms of HCS-primitives and HMPDUs. The behaviour at the upper boundary of the IUT is not explicitly specified. It is only possible to specify actions at the upper boundary in terms of the resulting events at PCO-L.

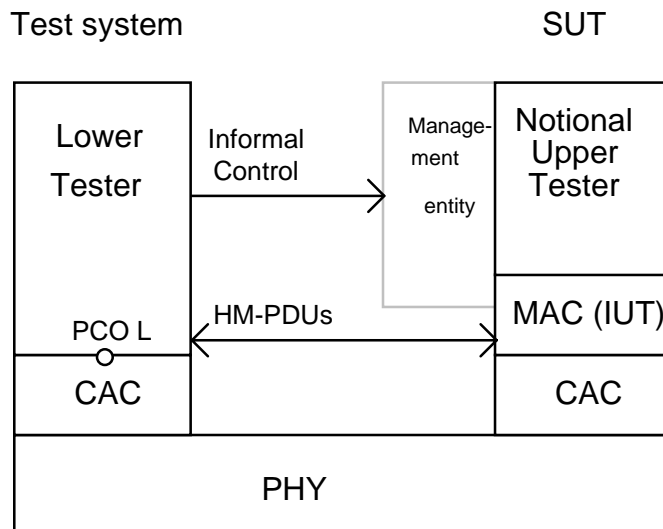


Figure 2: Remote test method

In this ATM the ATS uses implicit sends where the sending of a PDU requires an action at the upper boundary of the IUT. The use of an implicit send means "take whatever action is required to cause the IUT to send the specified PDU". Questions are included in the PIXIT regarding if, and how, such PDUs can be sent.

There are some disadvantages with this ATM:

- tests need to be deselected if the specified implicit sends are not possible according to the PIXIT;
- it is not possible to test what happens on reception of a PDU beyond detection of PDUs which are sent in response;
- it is not possible to test the correct implementation of functions such as encryption and decryption because the PDU at the upper boundary of the IUT cannot be specified or examined.

The main advantage of this ATM is that it imposes no additional requirements on the IUT beyond those in the protocol specification.

4.1.3 Choice of MAC ATM

The ATM used is selected via a test suite parameter whose value is assigned in the PIXIT.

The choice of ATM will have an effect on the coverage of the ATS. See subclause 6.2 for an indication of which test cases become untestable for particular ATMs. The co-ordinated test method gives the greater coverage because many test cases can only be tested using this ATM. On the other hand, there are no test cases which can only be tested using the remote test method.

4.2 ATM for CAC protocol

There are three different ATMs supported by the CAC ATS:

- co-ordinated embedded test method - for normal HIPERLAN implementations;
- remote embedded test method - for normal HIPERLAN implementations;
- remote test method - for HIPERLAN enhancement units.

In the embedded test methods the IUT is embedded under the HIPERLAN MAC layer and in the co-ordinated embedded test method the same upper tester as for the MAC ATS is used. Where the MAC layer can act as a forwarder the upper tester is never used and there are no implicit sends, therefore there is no difference between the Co-ordinated Embedded and Remote Embedded test methods.

The test method used depends on the test suite parameters **HEU** (HIPERLAN Enhancement Unit), **U_T** (Upper Tester) and **forwarder**:

- if **HEU** is true then the remote test method is used (in this case **U_T** and **forwarder** should be false as there is no CAC interface);
- otherwise if **forwarder** is true then the remote embedded test method (identical to co-ordinated embedded) is used;
- otherwise if **U_T** is true the co-ordinated embedded test method is used;
- otherwise the remote embedded test method is used.

5 Requirements on underlying layers for testing

5.1 MAC testing

5.1.1 CAC service for MAC testing

The underlying layers used for MAC testing shall provide the HIPERLAN CAC service as defined in ETS 300 652 [1] clause 7 with the following modifications:

- a) all HC-UNITDATA-request primitives issued by the IUT shall result in a HC-UNITDATA-indication primitive at the tester, except in the following situations:
 - there are simultaneous attempts to transmit by the IUT and the tester in which case the normal contention situation applies;
 - this is prevented due to errors in the physical layer.

In particular an HC-UNITDATA-indication primitive shall be invoked at the tester side even if the tester is not identified by the destination address parameter of an HC-UNITDATA-request primitive invoked by the IUT, although this would be contrary to ETS 300 652 [1] subclause 7.7;

- b) all HC-UNITDATA-request primitives issued by the IUT with the destination address being an individual HCSAP address not in the range 00 00 00 00 00 00 to 00 00 00 FF FF FF shall be considered successful and result in an HC-STATUS (successful) primitive issued unless the exceptions described in (a) above apply;
- c) there shall be a condition, the "busy condition", which can be controlled by the lower tester in which no HC-SYNC or HC-FREE primitives may be issued to the IUT. It shall be possible to terminate this condition with either an HC-SYNC or HC-FREE primitive being issued to the IUT (unless the CAC in the SUT does not support the synchronized channel access cycle in which case the HC-FREE is issued in both situations);
- d) there shall be a facility to measure and report the channel access priority used by the IUT when transmitting a DT-HCPDU following the termination of the busy condition.

NOTE: The busy condition is controlled by means of test suite operations.

5.1.2 CAC protocol for MAC testing

If the underlying layers in the SUT are according to ETS 300 652 [1] then the CAC protocol implemented in the tester shall conform to ETS 300 652 [1] clause 8 with the following modifications to support the modifications to the CAC service described above:

- a) the procedure in ETS 300 652 [1] subclause 8.4.6 (user data delivery) is executed on receipt of all DT-HCPDUs (irrespective of destination HCSAP address);

- b) the procedure in ETS 300 652 [1] subclause 8.5.5 (HCPDU reception) shall be modified such that an AK-HCPDU is generated and transmitted in all cases where an LBR-HBR HCPDU is received and not rejected, where DA is an individual HCSAP address not in the range 00 00 00 00 00 00 to 00 00 00 FF FF FF;
- c) the tester HC-entity shall transmit a busy condition burst in each of the following circumstances:
- on entering the busy condition if in the channel free condition at that time;
 - immediately following transmission or reception of a multicast DT-HMPDU in the busy condition;
 - immediately following transmission or reception of an AK-HCPDU in the busy condition;
 - on detection that an expected AK-HCPDU has not been received when in the busy condition;
 - when in the busy condition and a time i_{BC} has elapsed since the last transmission by the tester, except when awaiting an AK-HCPDU;

The minimum duration of a busy condition burst shall be 256 high bit-rate periods, there is no maximum duration specified. The burst shall not contain a DT-HCPDU addressed to the IUT (including a multicast DT-HCPDU) or an AK-HCPDU but is otherwise unspecified. The maximum duration of i_{BC} is 1 900 High bit-rate periods, no minimum duration is specified. For the purposes of determining the channel free condition the channel shall be considered idle during the transmission of these bursts.

- d) when the tester HC-entity is instructed to terminate the busy condition with an HC-SYNC primitive by means of a test suite operation it shall:
- if a channel access cycle is in progress transmit no further busy condition bursts. The test suite operation shall return at the time when HC-SYNC would normally be issued following that cycle (whether or not HC-SYNC is actually issued);
 - if in the channel free condition a multicast DT-HCPDU with an HCSAP destination address of All_Neighbours and an HCSDU field of length 1 octet is transmitted. An HC-STATUS (unsuccessful) is issued at the start of transmission of this HCPDU and the test suite operation returns following transmission of this HCPDU, no HC-SYNC or HC-STATUS (successful) is issued;
 - otherwise at the next time the channel free condition occurs no HC-FREE is issued but a multicast DT-HCPDU with an HCSAP destination address of All_Neighbours and an HCSDU field of length 1 octet is transmitted. The test suite operation returns following transmission of this HCPDU, no primitive is issued;
- e) if a DT-HCPDU is received in the channel access cycle following termination of the busy condition as described in d) then its channel access priority shall be determined and passed to the lower tester;
- f) when the tester HC-entity is instructed to terminate the busy condition with an HC-FREE primitive it shall:
- if a channel access cycle is in progress, transmit one busy condition burst at the end of that cycle (as when in the busy condition) and no further busy condition bursts. No HC-SYNC primitive shall be issued at the end of that channel access cycle. The test suite operation shall return i_{MF} following the end of that busy condition burst;
 - otherwise no further busy condition bursts are transmitted and the test suite operation shall return i_{MF} following the end of the last transmission by the tester.

5.1.3 PHY protocol for MAC testing

The PHY protocol used in the tester shall support the provision of the testing CAC service and, where applicable, the testing CAC protocol defined above. There are no further requirements defined.

NOTE: The PHY protocol in the tester may be according to ETS 300 652 [1], however modifications to facilitate testing are not excluded by this ETS.

5.2 CAC testing

5.2.1 PHY service interface for CAC testing

This PHY service interface is defined for the purposes of CAC testing only. It is purely abstract for the purpose of relating the Tree and Tabular Combined Notation (TTCN) test cases for the CAC with activity on the channel and is therefore defined in terms of the relationship between primitives at the PH-SAP with signals transmitted and received by the PHY of the test system. It does not define the overall PHY service provided between the PH-SAP in the test system and the PH-SAP in the SUT.

The model of the PHY service used here assumes that the tester PHY is able to detect transmissions from the IUT while it is transmitting, however it does not rely on it being able to demodulate such transmissions.

It is not intended to describe the mechanism by which a lower tester communicates with the PHY in a real test system. The timing of primitives are defined in relation to activity on the channel, so that such timings can be referred to within test cases. It is recognized that this prevents the primitives being generated in real time because it may not be possible to determine the time of an event such as the first bit of a burst until a finite time after the event occurs.

5.2.1.1 PHY service primitives

Table 1: PHY service primitives

Facility	Service	Primitive	Parameters
Data transfer	PHSDU transfer	PH-UNITDATA-request	(LBR_part, HBR_part)
		PH-UNITDATA-confirm	-
		PH-UNITDATA-indication	(LBR_part, HBR_part)
Channel access	Access control	PH-START-request	-
		PH-START-indication	-
		PH-END-request	-
		PH-END-indication	-
Initialization	Initialization	PH-RESET	-
Channel selection	Channel control	PH-CHANNEL	(Channel_no)

5.2.1.1.1 PH-UNITDATA-request (PH-UD-RQ)

This Abstract Service Primitive (ASP) is used to initiate transmission of an LBR or LBR-HBR HCPDU. The parameters contain the PDU to be transmitted, in the case of an LBR HCPDU HBR_part is null. The start of the burst (i.e. the first bit) is transmitted at the time of the primitive.

5.2.1.1.2 PH-UNITDATA-confirm (PH-UD-CO)

This ASP is issued by the PHY on completion of transmission of an HCPDU. The time of the primitive is at the end of the burst (i.e. the last bit).

5.2.1.1.3 PH-UNITDATA-indication (PH-UD-IN)

This ASP is issued by the PHY on completion of reception of an HCPDU. The parameters contain the received HCPDU, in the case of an LBR HCPDU HBR_part is null. The time of the primitive is at the end of the burst (i.e. the last bit).

5.2.1.1.4 PH-START-request (PH-ST-RQ)

This ASP is used to initiate the transmission of a channel access burst. The start of the burst (i.e. the first bit) is transmitted at the time of the primitive. The burst continues until a further primitive is received.

5.2.1.1.5 PH-START-indication (PH-ST-IN)

This ASP is issued by the PHY to indicate that it has detected the start of a transmission from the IUT. In the case of an LBR or LBR-HBR burst the time of the primitive is that of the start of the burst (i.e. the first bit). In other cases (e.g. channel access bursts) it may be the time when power is detected if it is not possible to accurately determine the start of the bit.

5.2.1.1.6 PH-END-request (PH-EN-RQ)

This ASP is used to stop the transmission of a channel access burst. The end of the burst (i.e. the last bit) is transmitted at the time of the primitive.

5.2.1.1.7 PH-END-indication (PH-EN-IN)

This ASP is issued by the PHY to indicate that it has detected the end of a transmission from the IUT, other than an HCPDU. It may also be issued at the end of an HCPDU if transmissions from the tester prevented its reception. The time of the primitive may be the time of the end of the burst (i.e. the last bit) or the time that power ceased to be detected.

5.2.1.1.8 PH-RESET (PH-REST)

This ASP is used to reset the state of the physical layer in the tester. When this primitive is received by the PHY any transmission in progress is terminated. If the receiver detects a signal at the time of the primitive then a PH-START-indication is issued, otherwise no primitive is issued in response.

5.2.1.1.9 PH-CHANNEL (PH-CHAN)

This ASP is used to request the tester to change channel. The parameter channel_no indicates the new channel to be used. Where the parameter is null any channel that the SUT is configured for operation on may be chosen.

NOTE: In practice it may not be necessary to implement this primitive because manual reconfiguration of the SUT between test cases is likely to be necessary for operation on different channels and manual re-configuration of the tester could be carried out at the same time.

5.2.1.2 Sequence of primitives

The possible sequences of primitives at the tester PHY interface are defined by figure 3 and table 2.

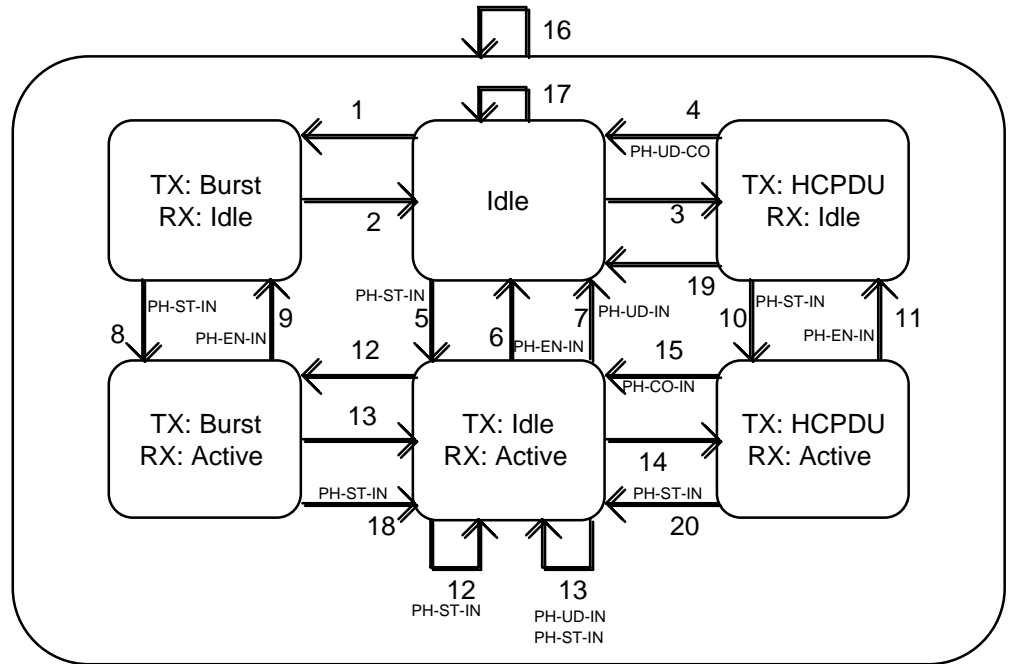


Figure 3: State transitions

Table 2: State transitions

TX state	Idle	Idle	Burst	Burst	HCPDU	HCPDU
RX state	Idle	Active	Idle	Active	Idle	Active
Abbreviation	II	IA	BI	BA	HI	HA
Action (TX)	None	None	Transmit Channel access burst	Transmit channel access burst	Transmit HCPDU	Transmit HCPDU
Events possible	RX_start	RX_end RX_HCPDU RX_end_HC RX_start_HC	RX_start	RX_end RX_HCPDU (note 1)	TX_end RX_start	TX_end RX_end RX_HCPDU (note 1)
PH-ST-RQ	1 BI	12 BA	X	X	X	X
PH-EN-RQ	X	X	2 II	13 IA	X	X
PH-UD-RQ	3 HI	14 HA	X	X	X	X
PH-REST	17 II	21 PH-ST-IN IA	2 II	18 PH-ST-IN IA	19 II	20 PH-ST-IN IA
PH-CHAN	16 II	16 IA	16 BI	16 BA	16 HI	16 HA
TX_end	-	-	-	-	4 PH-UD-CO II	15 PH-UD-CO IA
RX_start	5 PH-ST-IN IA	-	8 PH-ST-IN BA	-	10 PH-ST-IN HA	-
RX_end	-	6 PH-EN-IN II	-	9 PH-EN-IN BI	-	11 PH-EN-IN HI
RX_HCPDU	-	7 PH-UD-IN II	-	9 PH-EN-IN BI	-	11 PH-EN-IN HI
RX_end_HC	-	22 PH-UD-IN PH-ST-IN IA	-	-	-	-
RX_start_HC	-	21 PH-ST-IN IA	-	-	-	-

NOTE 1: In these states RX_end and RX_HCPDU cannot be distinguished.

NOTE 2: Explanation of symbols:

- n SS Transition number n to state SS
- n PP-PP-PP SS Transition number n to state SS issuing primitive PP-PP-PP
- n PP-PP-PP SS Transition number n to state SS issuing primitive PP-PP-PP (can only occur in case of error)
- X Invalid primitive for state
- Impossible event for state

The events referred to in table 2 are defined in table 3.

Table 3: Descriptions of events

Event	Description
TX_end	Completion of transmission of a HCPDU (i.e. sending of last bit).
RX_start	Detection of start of signal from IUT.
RX_end	Detection of end of signal from the IUT, but not the end of an HCPDU (see note).
RX_HCPDU	Detection of the end of an HCPDU and the signal from the IUT (see note).
RX_end_HC	Detection of the end of an HCPDU, but not the end of the signal from the IUT.
RX_start_HC	Detection of the start of an HCPDU, but not the start of the signal from the IUT.
NOTE:	While the tester is transmitting, RX_end and RX_HCPDU are considered indistinguishable. If the tester transmitted at any time while receiving a burst from the IUT RX_end may be generated instead of RX_HCPDU even if that burst contained an HCPDU.

6 Untestable test purposes

ETS 300 836-3 [8] specifies the Test Suite Structure and Test Purposes (TSS&TP) for HIPERLAN. Some Test Purposes (TP) cannot be tested with the specific test methods associated with this ATS specification; some of these cannot be tested with any standardized test method.

6.1 MAC protocol

In this ATS specification, for the MAC protocol part, the following TPs are considered untestable using the Co-ordinated Test Method or the Remote Test Method:

- MAC_FWD_4;
- MAC_FWD_35;
- MAC_FNF_2;
- MAC_QOS_1;
- MAC_TRA_6;
- MAC_TRA_7;
- MAC_VAR_7;
- MAC_VAR_14.

In this ATS specification, for the MAC protocol part, the following TPs are considered untestable using the Remote Test Method:

- MAC_LKP_2 to MAC_LKP_5;
- MAC_LKP_7;
- MAC_LKP_9;
- MAC_LKP_11;
- MAC_GPR_1;
- MAC_SAN_2;
- MAC_EDN_2;
- MAC_EDN_5;
- MAC_EDN_6;
- MAC_UDA_1;
- MAC_UDD_1;
- MAC_EXP_1;
- MAC_EXP_3;
- MAC_TRA_1;
- MAC_TRA_4;
- MAC_VAR_5;
- MAC_VAR_12;
- MAC_VAR_28 to MAC_VAR_30.

Some of the above test cases are very time critical and so the use of Implicit Send is not practical. In other cases it is required to test what the IUT does on receipt of HMPDUs and this is not possible using the Remote Test Method.

In addition to the above the following TPs are not testable using the Remote Test Method if the IUT is not a Forwarder:

- MAC_IPR_1 to MAC_IPR_16;
- MAC_SEL_1 to MAC_SEL_9;
- MAC_TRA_15 to MAC_TRA_19;
- MAC_TRA_22;
- MAC_REC_1 to MAC_REC_3;
- MAC_REC_5;
- MAC_REC_7;
- MAC_REM_1;
- MAC_VAR_1 to MAC_VAR_3;
- MAC_VAR_6;

- MAC_VAR_10;
- MAC_VAR_13;
- MAC_VAR_17;
- MAC_VAR_20;
- MAC_VAR_22 to MAC_VAR_23.

6.2 CAC protocol

The following TPs are untestable in all the test methods covered by the CAC ATS:

- CAC_CHA_1 to 6;
- CAC_OPS_1 to 9;

The following TPs are untestable in the Remote Embedded Test Method for implementations where the MAC in the SUT does not support forwarding:

- CAC_PRI_1, 16;
- CAC_CHA_10, 12, 15, 18 to 21.

The following TPs are untestable for an HEU (Remote Test Method). Those marked with an asterisk (*) are deemed to be untestable because the duration of the test would be unreasonably long:

- CAC_ELE_1*;
- CAC_YIE_1 to 12*;
- CAC_CHA_8, 22*;
- CAC_CHA_9 to 16, 18 to 21.

Some of the TPs from CAC_ELE_2 to 27 may also be considered untestable for HEUs because of the low probability of it using the correct number of elimination slots in a reasonable time.

7 ATS conventions

7.1 MAC ATS

7.1.1 Naming conventions

7.1.1.1 General

In many cases the naming conventions used in this ATS are simple and do not require detailed explanation. In most cases the names for identifiers have been derived directly from ETS 300 652 [1], and sometimes with some slight modification. For example, the Simple Type Definition "MSAP_address" is equivalent to "MSAP-address" as specified in ETS 300 652 [1]. Hyphens are not used in TTCN and in most cases, in this ATS where they would normally appear, they are replaced with the underscore character. The underscore character is also used for identifiers made up of several words, e.g. "MSDU_lifetime", "TRANSFER_status".

Abbreviations are also used and in most cases their derivation is self-explanatory e.g. "HIPERLAN_id" for "HIPERLAN identifier". Non-obvious derivations are explained in the following subclauses.

7.1.1.2 Timers

All timer identifiers are prefixed with "T_". Where timer names are taken from ETS 300 652 [1], the same name is used with the prefix added (e.g. T_tA for "t_A").

7.1.1.3 ASPs

In the TTCN ATS contained in annexes F and G, the exchange of HMPDUs between the LT and the IUT is expressed in terms of HCS-primitives. These primitives are named in the ATS in the style "HC_<name>_indication".

For the HC-UNITDATA indication primitive there are a number of variations, depending on which HMPDU is carried within the indication primitive. These variations of the HC-UNITDATA indication primitive could have been avoided by using the TTCN meta type **PDU**, but this was not suitable as values inside the HMPDUs (carried within the indication primitive) have to be referenced. Referencing elements inside a value of meta type **PDU** is not allowed according to ISO/IEC 9646-3 [4], so each ASP has to be defined as having a parameter of a specific PDU type. Thus the variations of the HC-UNITDATA indication primitive shown in table 4 have been defined:

Table 4

HC-UNITDATA_indication	definition using the meta type PDU
HC-UNITDATA_ind_DT	indication containing specifically a DT-HMPDU
HC-UNITDATA_ind_DT_CAP	indication containing specifically a DT-HMPDU plus channel priority
HC-UNITDATA_ind_DT_DT	indication containing specifically a DT-TMPDU (note)
HC-UNITDATA_ind_DT_LC	indication containing specifically a LC-TMPDU (note)
HC-UNITDATA_ind_HO	indication containing specifically a HO-HMPDU
HC-UNITDATA_ind_LC	indication containing specifically a LC-HMPDU
HC-UNITDATA_ind_TC	indication containing specifically a TC-HMPDU
HC-UNITDATA_ind_GP	indication containing specifically a GP-HMPDU
NOTE: TMPDUs are in fact contained within the UD field of DT-HMPDUs. Thus, for example, the HCSDU parameter of a HC-UNITDATA_ind_DT_DT contains a DT-HMPDU which in turn contains a DT-TMPDU within its UD field.	

7.1.1.3.1 Aliases for ASPs

In TTCN it is possible to define aliases for a number of data types, including ASPs. It is common practice to give an ASP an alias with a name representing the PDU carried within the ASP. Thus, for example, "HO" is an alias for " HC-UNITDATA_ind_HO". This is purely an aid to make the test cases, where these aliases are used, more readable by the human reader.

7.1.1.4 PDUs

The naming convention for PDUs is quite straightforward, e.g. "DT_HMPDU" is used for DT-HMPDU.

A number of PDUs have been specified for conveying TMPDUs. These are DT-HMPDUs whose UD field contains a specific type of TMPDU. These are as shown in table 5.

Table 5

CL_TMPDU_HMPDU	a DT-HMPDU containing a CL-TMPDU
DT_TMPDU_HMPDU	a DT-HMPDU containing a DT-TMPDU
LC_TMPDU_HMPDU	a DT-HMPDU containing a LC-TMPDU
LR_TMPDU_HMPDU	a DT-HMPDU containing a LR-TMPDU

7.1.1.5 Constraints

The constraints part of a TTCN ATS specifies the values of ASP parameters and PDU fields being sent to the IUT and conditions on ASP parameters and PDU fields received from the IUT.

In general the naming convention is quite straightforward.

7.1.1.5.1 ASPs

The following abbreviations are used:

HC-FRI:	HC-FREE indication;
HC-STI:	HC-STATUS indication;
HC-SYI:	HC-SYNC indication;
HCUDI:	HC-UNITDATA indication;
HCUDR:	HC-UNITDATA request.

There are several ASP constraints whose name is prefixed with "HCUDI". Several of these carry specific HMPDUs in the HCSDU parameter. These are named "HCUDI_" with the appropriate 2-character HMPDU identifier, plus number where required (e.g. "HCUDI_DT2").

Further varieties of "HCUDI_DT" are achieved by the addition of:

"_CAP":	to indicate special case where a channel access priority parameter is included;
"_DT":	to indicate that the embedded DT-HMPDU carries a DT-TMPDU;
"_LC":	to indicate that the embedded DT-HMPDU carries an LC-TMPDU.

7.1.1.5.2 PDUs

For HMPDUs, the name is prefixed with the HMPDU 2-character uppercase identifier. For valid instances of a HMPDU, and where there is more than one instance, a number is added to the prefix. For invalid instances, the string "inv" is added to the prefix. If more than one invalid instance, numbers are also added.

For example for TC-HMPDUs, there are 8 constraints and these are named TC1 to TC8. In addition, there are 4 constraints for invalid TC-HMPDUs and these are named TCinv, TCinv2, TCinv3 and TCinv4.

For HMPDUs which carry TMPDUs, the constraints use names which are the same as for the type definition but which are made up of lowercase characters instead of uppercase. In addition, where there are several instances, numbers are added to the name (e.g. "dt_tmpdu_hmpdu2").

In the special case of DT-HMPDUs where it is necessary to indicate that the data is encrypted or unencrypted, the constraint name has been postfixed with the character "e" for encrypted or the string "un" for unencrypted.

7.1.2 Test steps and defaults

Test steps are used to contain frequently used code. Test step names use lowercase characters (unless previously defined abbreviation e.g. DT). Preamble names are prefixed with the string "pre_". In test cases, local test steps are used where required by REPEAT loops and to avoid repetition of code local to a particular test case.

There is one default behaviour specified and this is attached to all test cases. The default allows for events that are valid but not specifically relevant to the test cases. It also captures the possibility of unspecified behaviour by the IUT through the "OTHERWISE" event.

7.1.3 Use of ASN.1

ASN.1 has been used for type definitions where it has not been possible to use TTCN. Types defined in ASN.1 can model problems that "pure" TTCN cannot. For instance, data structures modelling ordered or unordered sequences of data can best be defined using ASN.1.

ASN.1 types are necessary for test cases where the LT is receiving an HO-HMPDU or a TC-HMPDU and it is required to check that a particular {NA,NS} pair (HO-HMPDU) or {MSN, SMA} pair (TC-HMPDU) has been received. In these cases, it is unknown where the required pair will occur in a sequence of pairs. Thus it is necessary to define a particular pair as an element of a SET OF pairs. "SET OF" is available in ASN.1 and not in "pure" TTCN.

7.1.3.1 ASN.1 types

The identifier for the ASN.1 type consisting of a single pair of the fields is the names of the fields in upper case separated by an underscore with the suffix `_pair` (e.g. `NA_NS_pair`). The identifiers for the fields within this type are the names of the fields in lower case with an underscore as a suffix. (e.g. `na_` and `ns_`). (The underscore is needed because "ns" is a reserved word in TTCN, and is used throughout for consistency). The identifier for a SET OF pairs is similar to that of a single pair except that the suffix is `_pairs` (e.g. `NA_NS_pairs`). An ASN.1 enumerated type is used for the neighbour status.

ASN.1 is also used in some circumstances to define types which are not used within PDUs. `TRANSFER_status` is an enumerated type to represent the transfer status in the HC-STATUS indication primitive. `Gen_ASN1` is used internally as a mechanism to allow objects of more than one type to be passed as actual parameters to certain test suite operations.

7.1.3.2 ASN.1 encoding

The encoding for ASN.1 types used in this ATS is generally specified in the Detailed Comment field of the type definition. The exception to this is `TRANSFER_status` where no coding is applicable.

7.2 CAC ATS

7.2.1 Description (in test suite overview)

Where this is different from the test purposes (e.g. a short description of the objective) it starts with the word "Check" (all the TPs start with "Ensure").

7.2.2 Declarations

7.2.2.1 Type definitions

Simple: Similar to MAC: first word uppercase - rest lower case (some are defined differently from MAC).

Structured: Similar to MAC: HMPDUs are defined here - mostly upper case.

7.2.2.2 Test suite operations

General: Upper case -These are TSOs to do "standard" operations e.g. XOR.

Specific: Lower case - these are TSOs to do HIPERLAN specific operations. Prefixes such as `count_` and `round_` are used. e.g. `count_pri_slots`.

7.2.2.3 Test suite parameters

Mostly same as MAC, first word if more than one in upper case.

7.2.2.4 Selection expressions

First letter in upper case, rest lower case.

7.2.2.5 Test suite constants

General: First letter of each word in upper case - frequently same as MAC.

Timers (Defined in table 27 of ETS 300 652 [1]) e.g. `i_ps` is the duration of `iPS` in picoseconds.

7.2.2.6 Test suite variables

No specific rule - same as MAC where applicable.

7.2.2.7 Test case variables

Lower case.

7.2.2.8 PCOs

PH for Physical layer SAP.

7.2.2.9 Timers

Prefixed by T_. Protocol timers as MAC. The suffixes _less, _min, _max and _more are used to identify timers which have durations differing from the nominal value of a protocol timer.

7.2.2.10 ASPs

Short form of primitive name in upper case. Suffix (e.g._AK) when embedded HCPDU.

7.2.2.11 PDUs

Name of PDU with suffix _LBR or _HBR. (No suffix for AK_HCPDU as only LBR part present).

7.2.2.12 Aliases

2 letter ID of PDU type with suffix t (transmit) or r (receive) for PH_UD_RQ_?? And PH_UD_IN_??.

7.2.3 Constraints

7.2.3.1 ASPs containing PDUs, PDUs and fields of PDUs

The relationship between constraints is illustrated in figure 4 using as an example DT41 which is a send constraint for a DT-TMPDU containing a DT-HMPDU containing a DT-TMPDU.

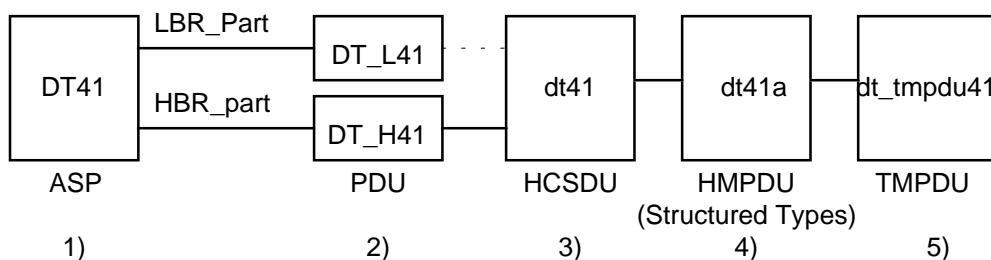


Figure 4: Example of relationship between CAC constraints

- 1) ASP constraints for PH_UD_? primitives are identified by two upper case letters identifying the HCPDU type and a two digit number. The numbers are assigned in groups as follows:
 - for AK-HCPDUs and CP-HCPDUs:
 - Group 0: 01 to 05 PDUs received by tester;
 - Group 1: 10 to 18 PDUs sent by tester.

- for DT-HCPDUs:
 - Group 0: 01 to 07 PDUs received by tester excluding those covered by other groups;
 - Group 1: 10 to 14 PDUs sent by tester excluding those covered by other groups;
 - Group 2: 20 to 33 PDUs containing errors sent by tester;
 - Group 4: 40 to 45 PDUs sent by tester containing DT-TMPDUs;
 - Group 5: 50 to 55 PDUs sent by tester containing DT-HMPDUs to be relayed by the SUT;
 - Group 6: 61 to 64 PDUs received by tester corresponding to these sent in groups 4 and 5.

The second digit of the number for groups 4 to 6 is the same for corresponding PDUs i.e. DT61 matches the PDU sent by the SUT on receiving DT41 or DT51.

- 2) For DT-HCPDUs and CP-HCPDUs there are two PDU constraints for each PDU, one for the LBR part and one the HBR part. For AK-HCPDUs there is only a constraint for the LBR part (in the ASP constraint the HBR part is given as "B). The identifiers for these constraints are two upper case letters identifying the HCPDU type, "_L" (for LBR part) or "_H" (for HBR part) and a number. In general the number is the same as that of the corresponding ASP constraint. In some situations PDU constraints are re-used in several ASP constraints. In these situations one ASP may be considered the basic constraint and the others variants of it (e.g. more specific or containing errors in only one of the PDU constraints), the re-used PDU constraint has the same number as the basic ASP constraint.
- 3) In the case of an DT-HCPDU there is a constraint of the structured type HCSDU for the content of the HCPDU. This contains one field out of a selection of different HMPDU types, or an OCTETSTRING for dummy HMPDUs. The identifier is two lower case letters identifying the HMPDU type and a number. For DT-HMPDUs this number has two digits and is generally the same as the HBR-part PDU constraint. Where the same DT-HMPDU constraint is used in both valid and invalid HBR-part PDU constraints the number of the valid one is used, in other circumstances where it is re-used an arbitrary choice has been made of which number to use. For other HMPDUs the number is unrelated to the PDU constraint.
- 4) If the HCSDU constraint is for an HMPDU then there is a structured type constraint for that HMPDU. The identifier is the same as the corresponding HCSDU constraint with "a" appended.
- 5) If the HMPDU is a DT-HMPDU with an embedded TMPDU there is a further structured type constraint for the TMPDU. The identifier is the name of the TMPDU (in lower case) and the same number as in the HCSDU and HMPDU constraint.

7.2.3.2 Other ASP constraints

Same as the ASP name with the "PH_" removed. Number appended if more than one.

7.2.4 Dynamic part

7.2.4.1 Labels

Two types of labels are used:

- L1: these are for jumps;
- i111: these are to identify paths in the test case (occasionally also used as target of GOTO).

The second type of label is used where there are a number of possible paths through the test case, the numbers identifying the path followed as it splits. 0 represents an unused level and 1, 2 etc. alternative paths.

EXAMPLE: Path i100 splits into i110 and i120; i110 may split further into i111 and i112. If further levels are needed, further digits are added.

7.2.4.2 Test steps

Preambles: prefix pre_, all lower case;

Checks: prefix check_, all lower case (These steps check for the receipt or non-receipt of a PDU);

Send: prefix send_, all lower case (These send PDUs, bursts etc.);

Test bodies: derived from the names of the test cases concerned, without the initial CAC_. Upper case.

8 ATS to TP map

The identifiers used for the TPs are reused as test case names. Thus there is a straightforward one-to-one mapping.

8.1 Combined TPs

In the ATS for the CAC protocol there are a number of instances where the test cases corresponding to two TPs would be identical. In these instances the test case appears in the ATS only once.

CAC_UDT_10 appears as CAC_UDT_9;

CAC_TRA_3 appears as CAC_UDT_3;

CAC_TRA_4 appears as CAC_UDT_6.

9 Conformance

9.1 PCTR conformance

A test laboratory, when requested by a client to produce a PCTR, is required, as specified in ISO/IEC 9646-5 [6], to produce a PCTR conforming with the PCTR template given in annex B of ISO/IEC 9646-5 [6].

Furthermore, a test laboratory, offering testing for the ATS specification(s) contained in this ETS, when requested by a client to produce a PCTR, is required to produce a PCTR conforming with the PCTR proforma contained in annex B of this ETS for the MAC protocol and in annex D for the CAC protocol.

A PCTR which conforms to the PCTR proforma specification contained in this ETS, shall preserve the content and ordering of the clauses contained in annex B or annex D. The sixth clause (B.6 or D.6) of the PCTR may contain additional columns. If included, these shall be placed to the right of the existing columns. Text in italics may be retained by the test laboratory.

9.2 PIXIT conformance

A test realizer, producing an executable test suite for the ATS specification(s) contained in this ETS, is required, as specified in ISO/IEC 9646-4 [5], to produce an augmented partial PIXIT proforma conforming with the partial PIXIT proforma specification contained in this ETS.

An augmented partial PIXIT proforma which conforms to the partial PIXIT proforma specification contained in this ETS shall, as a minimum, have contents which are technically equivalent to annex C of this ETS for the MAC protocol and in annex E for the CAC protocol. The augmented partial PIXIT proforma may contain additional questions that need to be answered in order to prepare the Means Of Testing (MOT) for a particular IUT.

A test laboratory, offering testing for the ATS specification(s) contained in this ETS, is required, as specified in ISO/IEC 9646-5 [6], to further augment the augmented partial PIXIT proforma to produce a PIXIT proforma conformant with the partial PIXIT proforma specification contained in this ETS.

A PIXIT proforma which conforms to the partial PIXIT proforma specification contained in this ETS shall, as a minimum, have contents which are technically equivalent to annex C of this ETS for the MAC protocol and annex E for the CAC protocol. The PIXIT proforma may contain additional questions that need to be answered in order to prepare the test laboratory for a particular IUT.

9.3 ATS conformance

The test realizer, producing a MOT and Executable Test Suite (ExTS) for the ATS specification(s) contained in this ETS, shall comply with the requirements of ISO/IEC 9646-4 [5]. In particular, these concern the realization of an ExTS based on each ATS. The test realizer shall provide a statement of conformance of the MOT to this ETS.

An ExTS which conforms to the ATS specification(s) contained in this ETS shall contain test groups and test cases which are technically equivalent to those contained in the ATS(s) in annex F and/or annex G. The ExTS shall, as a minimum, contain a subset of test cases which is the complete subset of test cases selected according to the selection expressions for a particular consistent set of test suite parameters.

All sequences of test events comprising an abstract test case shall be capable of being realized in the executable test case. Any further checking which the test system might be capable of performing is outside the scope of this ATS specification and shall not contribute to the verdict assignment for each test case.

Test laboratories running conformance test services using this ATS shall comply with ISO/IEC 9646-5 [6].

A test laboratory which claims to conform to this ATS specification shall use an MOT which conforms to this ATS.

Annex A (normative): Test Management Protocol (TMP) specification

To use the co-ordinated test method (MAC protocol) or the co-ordinated embedded test method (CAC protocol), the UT, residing above the MAC layer, shall implement the TMP as specified in this annex.

Implementation of the TMP requires the support of all the TMPDUs specified in the second clause of this annex. The first clause specifies the protocol associated with these TMPDUs.

A.1 TMP

The UT is required to be able to communicate with the MAC service via the primitives specified in clause 5 of ETS 300 652 [1]. All TMPDUs pass through the MAC. TMPDUs received by the UT are conveyed from the MAC to the UT in the MSDU parameter of a HM-UNITDATA indication primitive. TMPDUs transmitted by the UT are conveyed to the MAC in the MSDU parameter of a HM-UNITDATA request primitive.

A.1.1 Receipt of LR-TMPDU

On receipt of a LR-TMPDU, the UT shall generate a HM-LOOKUP request primitive.

A.1.2 Receipt of DT-TMPDU

On receipt of a DT-TMPDU, the UT shall generate a HM-UNITDATA request primitive where:

- the source address parameter is set to the value of the SA of the received DT-TMPDU;
- the destination address parameter is set to the value of the DA of the received DT-TMPDU;
- the MSDU parameter is set, in the same octet ordering, to the contents of the UD of the received DT-TMPDU;
- the user priority parameter is set to the value of the UP of the received DT-TMPDU;
- the MSDU lifetime parameter is set to the value of the ML of the received DT-TMPDU.

A.1.3 Receipt of CL-TMPDU

The CL-TMPDU is used to control the generation of TMPDUs by the UT. TMPDUs are generated by the UT and transmitted to the LT to convey information about the contents of primitives delivered by the MAC to the MAC user during the execution of the MAC protocol. The TMPDUs generated by the UT are the DT-TMPDU and the LC-TMPDU.

When a DT-TMPDU is generated, it is generated on receipt of a HM-UNITDATA indication, excluding those HM-UNITDATA indications which themselves convey TMPDUs (see note in subclause A.1.5). When an LC-TMPDU is generated, it is generated on receipt of a HM-LOOKUP confirm primitive. These two primitives are referred to as "TMPDU generating primitives" in the following text.

On receipt of a CL-TMPDU, the UT shall examine the CLC field and behave as follows:

- a CLC value of 1, indicates that the UT shall be configured so that on subsequent receipt of a TMPDU generating primitive, a corresponding TMPDU shall be generated and transmitted immediately;
- a CLC value of 0, indicates that the UT shall be configured so that on subsequent receipt of a TMPDU generating primitive, no corresponding TMPDU shall be generated;
- a CLC value other than 0, or 1, shall be ignored.

The default configuration for the UT shall be that associated with CLC value 0. The default configuration applies at power-up of the SUT. When the default configuration does not apply the current configuration is that associated with the CLC value (in the range 0 to 1) of the most recently received CL-TMPDU.

The DA field of the CL-TMPDU shall be stored by the UT and used as the destination address parameter when generated TMPDUs are transmitted in the form of HM-UNITDATA request primitives issued to the MAC (see subclause A.1.6).

A.1.4 Generation of LC-TMPDU

If the UT is configured for generation of TMPDUs, on receipt of a HM-LOOKUP confirm primitive, an LC-TMPDU is generated where its zero or more HID/HN pairs contain the HIPERLAN information parameter(s) of the received HM-LOOKUP confirm primitive(s). The information in each HID/HN pair shall be as contained in a LC-HMPDU received by the MAC.

A.1.5 Generation of DT-TMPDU

If the UT is configured for generation of TMPDUs, on receipt of a HM-UNITDATA indication (not containing a TMPDU), a DT-TMPDU is generated where:

- its SA contains the source address parameter of the HM-UNITDATA indication primitive;
- its DA contains the destination address parameter of the HM-UNITDATA indication primitive;
- its UD contains, in the same octet ordering, the MSDU parameter of the HM-UNITDATA indication primitive;
- its UP contains the user priority parameter of the HM-UNITDATA indication primitive;
- its ML contains the MSDU lifetime parameter of the HM-UNITDATA indication primitive;
- its RL contains the residual MSDU lifetime parameter of the HM-UNITDATA indication primitive.

NOTE: In the context of testing, two types of HM-UNITDATA indications will be delivered by the MAC to the MAC user (UT in this case): those conveying TMPDUs (instructions for the UT); and those conveying non-TMPDUs ("normal" MAC user data).

For the purposes of testing, the UT generates TMPDUs to "inform" the LT about the "normal" behaviour of the MAC. It is not intended that the receipt of TMPDUs by the UT is reported back to the LT, as the LT will have generated these TMPDUs in the first place. Thus only HM-UNITDATA indications conveying non-TMPDUs should be reported back to the LT.

The TMI (bit 8 of the 1st octet of each TMPDU) is used by the UT to distinguish TMPDUs from non-TMPDUs. This is taken into account by the LT when it transmits DT-HMPDUs, which are non-TMPDUs, to the IUT (i.e. the coding of the UD field will be such that bit 8 of the 1st octet is 0).

A.1.6 TMPDU transmission

This procedure is executed to transmit an LC-TMPDU or a DT-TMPDU which has been generated by the UT.

A HM-UNITDATA request primitive is issued to the MAC, where:

- the source address parameter is set to the local MSAP-address;
- the destination address parameter is set to DA as contained in the most recently received CL-TMPDU;
- the MSDU parameter is set, in the same octet ordering, to the TMPDU;
- the user priority parameter is set to zero (high priority); and
- MSDU lifetime is set to 500 ms.

A.2 Test Management PDUs (TMPDUs)

A.2.1 TMPDUs received by the UT

A.2.1.1 LR-TMPDU

The structure of a LR-TMPDU is shown in figure A.1.

TMPDU indicator field (TMI) [bit 8] = 1	HMPDU type indicator field (TI) = 2	Octet 1
-----------------------------------------	-------------------------------------	------------

Figure A.1: The structure of a LR-TMPDU

A.2.1.2 DT-TMPDU

The structure of a DT-TMPDU, for reception by the UT, is shown in figure A.2.

TMPDU indicator field (TMI) [bit 8] = 1	HMPDU type indicator field (TI) = 1	Octet 1
Source MSAP-address field (SA)		2 — 7
Destination MSAP-address field (DA)		8 — 13
User data field (UD)		14 — (n-2)
User priority field (UP) [bit 8]	MSDU lifetime field (ML)	(n-1)
<i>Residual HMPDU lifetime field (RL) (note)</i>		n

NOTE: RL is only included in a DT-TMPDU transmitted by the UT and therefore is not included in DT-TMPDUs received by the UT.

Figure A.2: The structure of a DT-TMPDU

A.2.1.3 CL-TMPDU

The structure of a Control TMPDU (CL-TMPDU) is shown in figure A.3.

TMPDU indicator field (TMI) [bit 8] = 1	HMPDU type indicator field (TI) = 8	Octet 1
Control code field (CLC)		2
Destination MSAP-address field (DA)		3 — 8

Figure A.3: The structure of a CL-TMPDU

The control codes for the CLC are shown in table A.1.

Table A.1: Control codes for CL-TMPDU

Code:	Meaning
0	ignore received primitives (see note)
1	immediate response to received primitives
2 to 255	reserved codings
NOTE:	"Received primitives" are limited to HM-UNITDATA indication primitive and HM-LOOKUP confirm primitive.

A.2.2 TMPDUs transmitted by the UT

A.2.2.1 LC-TMPDU

The structure of a LC-TMPDU is shown in figure A.4.

		Octet
TMPDU indicator field (TMI) [bit 8] = 1	HMPDU type indicator field (TI) = 3	1
HIPERLAN identifier field (HID) (see note)		2 — 5
HIPERLAN name field (HN) (see note)		6 — 69
{ HID, HN } pairs		70 — (n-69)
(HID)		(n-68) — (n-65)
(HN)		(n-64) — n

NOTE: The HID and the HN exist in pairs in an LC-TMPDU. There may be 0 up to any number of { HID, HN } pairs in an LC-TMPDU, subject to the maximum size of an LC-TMPDU.

Figure A.4: The structure of an LC-TMPDU

A.2.2.2 DT-TMPDU

The structure of a DT-TMPDU, for transmission by the UT, is shown in figure A.5.

		Octet
TMPDU indicator field (TMI) [bit 8] = 1	HMPDU type indicator field (TI) = 1	1
Source MSAP-address field (SA)		2 — 7
Destination MSAP-address field (DA)		8 — 13
User data field (UD)		14 — (n-2)
User priority field (UP) [bit 8]	MSDU lifetime field (ML)	(n-1)
		n
Residual HMPDU lifetime field (RL) (see note)		(n+1) — (n+2)

NOTE: The RL is only included in a DT-TMPDU transmitted by the UT (not included in DT-TMPDUs received by the UT).

Figure A.5: The structure of a DT-TMPDU

B.1.4 Limits and reservations

Additional information relevant to the technical contents or further use of the test report, or to the rights and obligations of the test laboratory and the client, may be given here. Such information may include restriction on the publication of the report.

B.1.5 Comments

Additional comments may be given by either the client or the test laboratory on any of the contents of the PCTR, for example, to note disagreement between the two parties.

B.2 IUT conformance status

This IUT has or has not been shown by conformance assessment to be non-conforming to the specified protocol specification.

Strike the appropriate words in this sentence. If the PICS for this IUT is consistent with the static conformance requirements (as specified in clause B.3 of this report) and there are no "FAIL" verdicts to be recorded (in clause B.6) strike the words "has or", otherwise strike the words "or has not".

B.3 Static conformance summary

The PICS for this IUT is or is not consistent with the static conformance requirements in the specified protocol.

Strike the appropriate words in this sentence.

B.4 Dynamic conformance summary

The test campaign did or did not reveal errors in the IUT.

Strike the appropriate words in this sentence. If there are no "FAIL" verdicts to be recorded (in clause B.6 of this ETS) strike the words "did or", otherwise strike the words "or did not".

Summary of the results of groups of tests:

B.5 Static conformance review report

If clause B.3 indicates non-conformance, this subclause itemises the mismatches between the PICS and the static conformance requirements of the specified protocol specification.

B.6 Test campaign report

ATS Reference	Selected ? (Y/N)	Run ? (Y/N)	Verdict	Observations
MAC_LKP_1				
MAC_LKP_2				
MAC_LKP_3				
MAC_LKP_4				
MAC_LKP_5				
MAC_LKP_6				
MAC_LKP_7				
MAC_LKP_8				
MAC_LKP_9				
MAC_LKP_10				

MAC_FWD_1				
MAC_FWD_2				
MAC_FWD_3				
MAC_FWD_5				
MAC_FWD_6				
MAC_FWD_7				
MAC_FWD_8				
MAC_FWD_9				
MAC_FWD_10				
MAC_FWD_11				
MAC_FWD_12				
MAC_FWD_13				
MAC_FWD_14				
MAC_FWD_15				
MAC_FWD_16				
MAC_FWD_17				
MAC_FWD_18				
MAC_FWD_19				
MAC_FWD_20				
MAC_FWD_21				
MAC_FWD_22				
MAC_FWD_23				
MAC_FWD_24				
MAC_FWD_25				
MAC_FWD_26				
MAC_FWD_27				
MAC_FWD_28				
MAC_FWD_29				
MAC_FWD_30				
MAC_FWD_31				
MAC_FWD_32				
MAC_FWD_33				
MAC_FWD_34				
MAC_FWD_36				
MAC_FWD_37				
MAC_FWD_38				
MAC_FWD_39				
MAC_FWD_40				
MAC_NFD_1				
MAC_NFD_2				
MAC_NFD_3				
MAC_NFD_4				
MAC_NFD_5				
MAC_NFD_6				
MAC_NFD_7				
MAC_NFD_8				
MAC_NFD_9				
MAC_NFD_10				
MAC_NFD_11				
MAC_NFD_12				
MAC_NFD_13				
MAC_FNF_1				
MAC_FNF_3				
MAC_FNF_4				
MAC_FNF_5				
MAC_FNF_6				

MAC_MRD_1				
MAC_MRD_2				
MAC_MRD_3				
MAC_MRD_4				
MAC_MRD_5				
MAC_MRD_6				
MAC_MRD_7				
MAC_ALI_1				
MAC_ALI_2				
MAC_ALI_3				
MAC_ALI_4				
MAC_ALI_5				
MAC_FOR_1				
MAC_FOR_2				
MAC_FOR_3				
MAC_FOR_4				
MAC_FOR_5				
MAC_ROU_1				
MAC_ROU_2				
MAC_ROU_3				
MAC_ROU_4				
MAC_ROU_5				
MAC_ROU_6				
MAC_ROU_7				
MAC_ROU_8				
MAC_ROU_9				
MAC_ROU_10				
MAC_ROU_11				
MAC_ROU_12				
MAC_IPD_1				
MAC_IPD_2				
MAC_IPD_3				
MAC_IPR_1				
MAC_IPR_2				
MAC_IPR_3				
MAC_IPR_4				
MAC_IPR_5				
MAC_IPR_6				
MAC_IPR_7				
MAC_IPR_8				
MAC_IPR_9				
MAC_IPR_10				
MAC_IPR_11				
MAC_IPR_12				
MAC_IPR_13				
MAC_IPR_14				
MAC_IPR_15				
MAC_IPR_16				
MAC_GPD_1				
MAC_GPD_2				
MAC_GPR_1				

MAC_SAN_1				
MAC_SAN_2				
MAC_EDN_1				
MAC_EDN_2				
MAC_EDN_3				
MAC_EDN_4				
MAC_EDN_5				
MAC_EDN_6				
MAC_UDA_1				
MAC_UDA_2				
MAC_UDD_1				
MAC_EXP_1				
MAC_EXP_2				
MAC_EXP_3				
MAC_SEL_1				
MAC_SEL_2				
MAC_SEL_3				
MAC_SEL_4				
MAC_SEL_5				
MAC_SEL_6				
MAC_SEL_7				
MAC_SEL_8				
MAC_SEL_9				
MAC_TRA_1				
MAC_TRA_2				
MAC_TRA_3				
MAC_TRA_4				
MAC_TRA_5				
MAC_TRA_8				
MAC_TRA_9				
MAC_TRA_10				
MAC_TRA_11				
MAC_TRA_12				
MAC_TRA_13				
MAC_TRA_14				
MAC_TRA_15				
MAC_TRA_16				
MAC_TRA_17				
MAC_TRA_18				
MAC_TRA_19				
MAC_TRA_20				
MAC_TRA_21				
MAC_TRA_22				
MAC_REC_1				
MAC_REC_2				
MAC_REC_3				
MAC_REC_4				
MAC_REC_5				
MAC_REC_6				
MAC_REC_7				

MAC_REM_1				
MAC_REM_2				
MAC_VAR_1				
MAC_VAR_2				
MAC_VAR_3				
MAC_VAR_4				
MAC_VAR_5				
MAC_VAR_6				
MAC_VAR_8				
MAC_VAR_9				
MAC_VAR_10				
MAC_VAR_11				
MAC_VAR_12				
MAC_VAR_13				
MAC_VAR_15				
MAC_VAR_16				
MAC_VAR_17				
MAC_VAR_18				
MAC_VAR_19				
MAC_VAR_20				
MAC_VAR_21				
MAC_VAR_22				
MAC_VAR_23				
MAC_VAR_24				
MAC_VAR_25				
MAC_VAR_26				
MAC_VAR_27				
MAC_VAR_28				
MAC_VAR_29				
MAC_VAR_30				

B.7 Observations

Additional information relevant to the technical content of the PCTR are given here.

Annex C (normative): Partial PIXIT proforma for MAC

Notwithstanding the provisions of the copyright clause related to the text of this ETS, ETSI grants that users of this ETS may freely reproduce the partial PIXIT proforma in this annex so that it can be used for its intended purposes and may further publish the completed PIXIT.

C.1 Identification summary

PIXIT Number:

Test Laboratory Name:

Date of Issue:

Issued to:

C.2 Abstract test suite summary

Protocol Specification: ETS 300 652 [1]

ATS Specification: ETS 300 836-4

Abstract Test Method: See table C.1.

Table C.1: Abstract Test Method

Item	Question	Answer (Y/N)
0.1	Test IUT using Co-ordinated test method?	
0.2	Test IUT using Remote test method?	
NOTE:	A "Yes" answer for one and only one of these items is required. If testing is to be performed using both methods, a second PIXIT should be completed.	

C.3 Test laboratory

Test Laboratory Identification:

Accreditation status of the test service:

Accreditation reference:

Test Laboratory Manager:

Test Laboratory contact:

Means of Testing:

Test Laboratory instructions for Completion:

C.4 Client (of the Test Laboratory)

Client Identification:

Client Test manager:

Client contact:

Test Facilities required:

C.5 SUT

Name:

Version:

SCS Reference:

Machine configuration:

Operating System Identification:

IUT Identification:

PICS (all layers):

Limitations of the SUT:

Environmental Conditions:

C.6 Protocol information

C.6.1 Protocol identification

Specification reference: ETS 300 652 [1]

Protocol Version:

PICS Reference:

NOTE: The PICS Reference should reference a completed PICS which is conformant with the PICS proforma contained in ETS 300 836-2 [7].

C.6.2 Addresses

Table C.2: Addresses

Item	Question	Value
1.1	IUT's MSAP address? <i>(provided by Client)</i>	----- Hex
1.2	Group MSAP address inclusively identifying the IUT? <i>(provided by Client)</i>	----- Hex
1.3	Lower Tester's MSAP address? <i>(provided by Test Laboratory; cannot be in the range: 00 00 00 00 00 00 to 00 00 00 FF FF FF)</i>	----- Hex

C.6.3 Parameter values

Table C.3: Parameter values

Item	Question	Value type	Value
2.1	Name of HIPERLAN of which the IUT is a member?	HIPERLAN name	
2.2	Name of HIPERLAN of which the IUT is not a member?	HIPERLAN name	
2.3	HID to which IUT is assigned?	HIPERLAN identifier	
2.4	Identity of HIPERLAN of which the IUT is not a member?	HIPERLAN identifier	
2.5	Can IUT be assigned to a specific HIPERLAN?	Boolean	
2.6	Can IUT be configured for KID = 0?	Boolean	
2.7	Can IUT be configured for KID other than 0?	Boolean	
2.8	Can IUT be configured to have sufficient memory to record new group-attendance pattern entry?	Boolean	
2.9	Can IUT be configured to have sufficient memory to record new individual-attention pattern entry?	Boolean	
2.10	Can IUT be stimulated to schedule its reception of multicast HCPDUs according to a neighbouring p-supporter's declared group-attendance practice interval?	Boolean	
2.11	Number of entries IUT can hold in its Duplicate detection information base?	Integer	
2.12	Number of entries in Neighbour information base? (Size used in ATS: 2, see note 2)	Integer < 2 ≥ 2	Value: __ [] Yes [] No
2.13	Number of entries in Hello information base? (Size used in ATS: 4, see note 2)	Integer < 4 ≥ 4	Value: __ [] Yes [] No
2.14	Number of entries in Topology information base? (Size used in ATS: 7, see note 2)	Integer < 7 ≥ 7	Value: __ [] Yes [] No
2.15	Number of entries in route information base? (Size used in ATS: 6, see note 2)	Integer < 6 ≥ 6	Value: __ [] Yes [] No
Example of encrypted DT-HMPDU (note 3):		-	-
2.16.1	Value of KID for example encrypted DT-HMPDU (2-bit non-zero field)?	2 bits	
2.16.2	Value of IV for example encrypted DT-HMPDU (30-bit field)?	30 bits	
2.16.3	Value of UD for example encrypted DT-HMPDU ("ABC" encrypted)? (see note 4)	3 octets	
2.16.4	Value of 1st octet of SC for example encrypted DT-HMPDU?	1 octet	
2.16.5	Value of 2nd octet of SC for example encrypted DT-HMPDU?	1 octet	
NOTE 1:	Questions which are relevant for the IUT need only be answered.		
NOTE 2:	If the sizes of the information bases are dynamically variable then the answers to these questions should be for a possible combination, in choosing this combination preference should be given to ensuring that the "Size used in ATS" is satisfied for the Neighbour, Hello, Topology and Route information bases in that order. If the answer to any to any of these questions is greater than or equal to the size used in ATS, then the value of the corresponding test suite parameter can be any value in that range.		
NOTE 3:	Answers to these questions should be supplied even if encryption/decryption procedures are not supported (to enable testing of IUT's reaction to receipt of encrypted DT-HMPDU).		
NOTE 4:	Bit 8 of the first octet of this 3 octet string shall be non-zero.		

C.6.4 Sending of PDUs by IUT

Table C.4: Actions required to stimulate IUT to send PDUs

Item	Action: What actions, if possible, have to be taken to cause the IUT to send a..	Supported Y/N	Stimulus (action taken)
3.1	DT-HMPDU with UD field containing "ABC" and with DA field containing the Lower Tester's MSAP address.		
3.2	Encrypted DT-HMPDU with UD field containing "ABC" (encrypted) and with DA field containing the Lower Tester's MSAP address.		
3.3	Unencrypted DT-HMPDU with UD field containing "ABC" and with DA field containing the Lower Tester's MSAP address.		
3.4	DT-HMPDU with UD field containing "ABC" and with DA field containing a Group Address.		
3.5	DT-HMPDU with UD field containing "DEF" and with DA field containing the Lower Tester's MSAP address.		
3.6	DT-HMPDU with UD field containing "ABC" and with PSN field set to "1" and DA field set to "0".		
3.7	DT-HMPDU with DA field containing an arbitrary individual MSAP address (dynamically selected by the tester when required).		
3.8	DT-HMPDU with DA field containing the group MSAP address specified in item 1.2.		
3.9	LR-HMPDU.		

Annex D (normative): CAC PCTR proforma

Notwithstanding the provisions of the copyright clause related to the text of this ETS, ETSI grants that users of this ETS may freely reproduce the PCTR proforma in this annex so that it can be used for its intended purposes and may further publish the completed PCTR.

D.1 Identification summary

D.1.1 Protocol conformance test report

PCTR number:	
PCTR Date:	
Corresponding SCTR number:	
Corresponding SCTR date:	
Test Laboratory identification:	
Test Laboratory Manager:	
Signature:	

D.1.2 IUT identification

Name:	
Version:	
Protocol specification:	ETS 300 652 [1] clause 8, subclauses 11.1.2 and 11.2
PICS:	
Previous PCTRs (if any)	

D.1.3 Testing environment

PIXIT Reference number:	
ATS Specification:	ETS 300 836-4
Abstract Test Method:	
Means of Testing identification:	
Dates of testing:	
Conformance Log reference(s):	
Retention Date for Log reference(s):	

D.1.4 Limits and reservations

Additional information relevant to the technical contents or further use of the test report, or to the rights and obligations of the test laboratory and the client, may be given here. Such information may include restriction on the publication of the report.

D.1.5 Comments

Additional comments may be given by either the client or the test laboratory on any of the contents of the PCTR, for example, to note disagreement between the two parties.

D.2 IUT conformance status

This IUT has or has not been shown by conformance assessment to be non-conforming to the specified protocol specification.

Strike the appropriate words in this sentence. If the PICS for this IUT is consistent with the static conformance requirements (as specified in clause D.3 of this report) and there are no "FAIL" verdicts to be recorded (in clause D.6) strike the words "has or", otherwise strike the words "or has not".

D.3 Static conformance summary

The PICS for this IUT is or is not consistent with the static conformance requirements in the specified protocol.

Strike the appropriate words in this sentence.

D.4 Dynamic conformance summary

The test campaign did or did not reveal errors in the IUT.

Strike the appropriate words in this sentence. If there are no "FAIL" verdicts to be recorded (in clause D.6 of this ETS) strike the words "did or", otherwise strike the words "or did not".

Summary of the results of groups of tests:

D.5 Static conformance review report

If clause D.3 indicates non-conformance, this subclause itemises the mismatches between the PICS and the static conformance requirements of the specified protocol specification.

D.6 Test campaign report

ATS Reference	Selected ? (Y/N)	Run ? (Y/N)	Verdict	Observations
CAC_PRI_1				
CAC_PRI_2				
CAC_PRI_3				
CAC_PRI_4				
CAC_PRI_5				
CAC_PRI_6				
CAC_PRI_7				
CAC_PRI_8				
CAC_PRI_9				
CAC_PRI_10				
CAC_PRI_11				
CAC_PRI_12				
CAC_PRI_13				
CAC_PRI_14				
CAC_PRI_15				
CAC_PRI_16				
CAC_PRI_17				
CAC_PRI_18				
CAC_PRI_19				
CAC_PRI_20				

CAC_ELE_1				
CAC_ELE_2				
CAC_ELE_3				
CAC_ELE_4				
CAC_ELE_5				
CAC_ELE_6				
CAC_ELE_7				
CAC_ELE_8				
CAC_ELE_9				
CAC_ELE_10				
CAC_ELE_11				
CAC_ELE_12				
CAC_ELE_13				
CAC_ELE_14				
CAC_ELE_15				
CAC_ELE_16				
CAC_ELE_17				
CAC_ELE_18				
CAC_ELE_19				
CAC_ELE_20				
CAC_ELE_21				
CAC_ELE_22				
CAC_ELE_23				
CAC_ELE_24				
CAC_ELE_25				
CAC_ELE_26				
CAC_ELE_27				
CAC_YIE_1				
CAC_YIE_2				
CAC_YIE_3				
CAC_YIE_4				
CAC_YIE_5				
CAC_YIE_6				
CAC_YIE_7				
CAC_YIE_8				
CAC_YIE_9				
CAC_YIE_10				
CAC_YIE_11				
CAC_YIE_12				
CAC_YIE_13				
CAC_TRP_1				

CAC_CHA_7				
CAC_CHA_8				
CAC_CHA_9				
CAC_CHA_10				
CAC_CHA_11				
CAC_CHA_12				
CAC_CHA_13				
CAC_CHA_14				
CAC_CHA_15				
CAC_CHA_16				
CAC_CHA_17				
CAC_CHA_18				
CAC_CHA_19				
CAC_CHA_20				
CAC_CHA_21				
CAC_CHA_22				
CAC_CPD_1				
CAC_CPD_2				
CAC_CPD_3				
CAC_CPD_4				
CAC_CPR_1				
CAC_CPR_2				
CAC_CPR_3				
CAC_CPR_4				
CAC_CPR_5				
CAC_CPR_6				
CAC_UDT_1				
CAC_UDT_3				
CAC_UDT_4				
CAC_UDT_5				
CAC_UDT_6				
CAC_UDT_8				
CAC_UDT_9				
CAC_LBR_1				
CAC_LBR_2				
CAC_LBR_3				
CAC_HBR_1				
CAC_HBR_2				
CAC_HDA_1				
CAC_HDA_2				
CAC_HDA_3				
CAC_TRA_1				
CAC_TRA_2				
CAC_TRA_5				
CAC_TRA_6				

CAC_REC_1				
CAC_REC_2				
CAC_REC_4				
CAC_REC_5				
CAC_REC_6				
CAC_REC_7				
CAC_REC_8				
CAC_REC_9				
CAC_REC_10				
CAC_VAR_1				
CAC_VAR_2				
CAC_VAR_3				
CAC_VAR_4				
CAC_VAR_5				
CAC_VAR_6				
CAC_VAR_7				
CAC_VAR_8				
CAC_VAR_9				
CAC_VAR_10				
CAC_VAR_11				
CAC_VAR_12				
CAC_VAR_14				
CAC_VAR_15				
CAC_VAR_16				
CAC_VAR_17				
CAC_VAR_18				
CAC_VAR_19				
CAC_VAR_20				
CAC_VAR_21				
CAC_VAR_22				
CAC_VAR_23				
CAC_VAR_24				
CAC_VAR_25				
CAC_VAR_26				

D.7 Observations

Additional information relevant to the technical content of the PCTR are given here.

Annex E (normative): Partial PIXIT proforma for CAC

Notwithstanding the provisions of the copyright clause related to the text of this ETS, ETSI grants that users of this ETS may freely reproduce the partial PIXIT proforma in this annex so that it can be used for its intended purposes and may further publish the completed PIXIT.

E.1 Identification summary

PIXIT Number:

Test Laboratory Name:

Date of Issue:

Issued to:

E.2 Abstract test suite summary

Protocol Specification: ETS 300 652 [1]

ATS Specification: ETS 300 836-4

Abstract Test Method: See table E.1.

Table E.1: Abstract Test Method

Item	Question	Answer (Y/N)
C0.1	Test IUT using Co-ordinated embedded test method?	
C0.2	Test IUT using Remote test method?	
NOTE:	A "Yes" answer for one and only one of these items is required. If testing is to be performed using both methods, a second PIXIT should be completed. See also ETS 300 836-4, subclause 4.2.	

E.3 Test laboratory

Test Laboratory Identification:

Accreditation status of the test service:

Accreditation reference:

Test Laboratory Manager:

Test Laboratory contact:

Means of Testing:

Test Laboratory instructions for Completion:

E.4 Client (of the Test Laboratory)

Client Identification:

Client Test manager:

Client contact:

Test Facilities required:

E.5 SUT

Name:

Version:

SCS Reference:

Machine configuration:

Operating System Identification:

IUT Identification:

PICS (all layers):

Limitations of the SUT:

Environmental Conditions:

E.6 Protocol information

E.6.1 Protocol identification

Specification reference: ETS 300 652 [1]

Protocol Version:

PICS Reference:

NOTE: The PICS Reference should reference a completed PICS which is conformant with the PICS proforma contained in ETS 300 836-2 [7].

E.6.2 Addresses

Table E.1: Addresses

Item	Question	Value
C1.1	IUT's MSAP address? (provided by Client)	_____ Hex
C1.2	not used	
C1.3	Lower Tester's MSAP address? (provided by Test Laboratory: cannot be in the range: 00 00 00 00 00 00 to 00 00 00 FF FF FF)	_____ Hex
C1.4	Individual MSAP address different from IUT's and Lower Tester's MSAP addresses? (provided by Client)	_____ Hex
NOTE: Where the IUT is a HEU, the client is not required to answer any of these questions.		

E.6.3 Parameter values

Table E.2: Parameter values

Item	Question	Value type	Value
C2.1	HID to which IUT is assigned?	HIPERLAN identifier	
C2.2	Provide sample MAC UD field containing 2 383 octets	Octetstring	
C2.3	Provide sample MAC UD field containing 2 435 octets	Octetstring	
C2.4	Provide sample MAC UD field containing 2 330 octets	Octetstring	
C2.5	Provide sample MAC UD field containing 2 331 octets	Octetstring	
C2.6	Provide sample MAC UD field containing 2 332 octets	Octetstring	
C2.7	Does IUT, a HEU, transmit at least one CP-HCPDU every 60 s?	Boolean	
NOTE: Questions which are relevant for the IUT need only be answered.			

E.6.4 Sending of PDUs by IUT

Table E.3: Actions required to stimulate IUT to send PDUs

Item	Action: What actions, if possible, have to be taken to cause the IUT to send a..	Supported Y/N	Stimulus (action taken)
C3.1	DT-HCPDU with UD field containing a DT-HMPDU		
C3.2	DT-HCPDU with UD field containing a DT-HMPDU with 2 330 octet UD field		
C3.3	DT-HCPDU with UD field containing a DT-HMPDU with 2 331 octet UD field		
C3.4	DT-HCPDU with UD field containing a DT-HMPDU with 2 332 octet UD field		
C3.5	CP-HCPDU with any valid contents (note)		
C3.6	CP-HCPDU with C3 and C4 set to 0 (note)		
C3.7	CP-HCPDU with C3 set to 1 (note)		
C3.8	CP-HCPDU with C4 set to 1 (note)		
NOTE: Only to be answered where IUT is HEU.			

Annex F (normative): Graphical Representation (GR) format of ATS

F.1 GR for MAC ATS

The TTCN.GR representation of this ATS is contained in a PDF file (H1_MAC.PDF contained in archive 8364_E1.LZH) which accompanies the present document.

F.2 GR for CAC ATS

The TTCN.GR representation of this ATS is contained in a PDF file (H1_CAC.PDF contained in archive 8364_E1.LZH) which accompanies the present document.

Annex G (normative): Machine Processable (MP) format of ATS

G.1 MP for MAC ATS

The TTCN.MP representation corresponding to this ATS is contained in an ASCII file (H1_MAC.MP contained in archive 8364_E1.LZH) which accompanies the present document.

G.2 MP for CAC ATS

The TTCN.MP representation corresponding to this ATS is contained in an ASCII file (H1_CAC.MP contained in archive 8364_E1.LZH) which accompanies the present document.

NOTE: According to ISO/IEC 9646-3 [4], in case of a conflict in interpretation of the operational semantics of TTCN.GR and TTCN.MP, the operational semantics of the TTCN.GR representation takes precedence.

History

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