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Intelligent Transport Systems (ITS);
Communications Access for Land Mobiles (CALM);
Test specifications for Access Technology Support
(ISO 21218);
Part 2: Test Suite Structure and Test Purposes (TSS & TP)

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 2 of a multi-part deliverable covering the test specifications for ITS access technology support (service access points and related procedures) ISO 21218 [1] as identified below:

Part 1: "Implementation Conformance Statement (ICS) proforma";

Part 2: "Test Suite Structure and Test Purposes (TSS & TP)";

Part 3: "Abstract Test Suite (ATS) and partial PIXIT proforma".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

Communications for Intelligent Transport Systems (ITS) is standardized at ISO TC204 WG16 under the acronym CALM (Communications Access for Land Mobiles). The communications architecture of ITS and cooperative ITS and the concept of an ITS station (ITS-S) as a "Bounded Secured Managed Domain" (BSMD) are specified in ISO 21217 [i.1]. The ITS-S architecture is based on the OSI model as illustrated in figure 1.

An implementation of a BSMD is named an "ITS station unit" (ITS-SU), or more precisely a "Bounded Secured Managed Entity" (BSME), which may consist of one or several physical units named "ITS station communication units" (ITS-SCU). ITS-SCUs are interconnected via the ITS station-internal network specified in ISO 21217 [i.1].

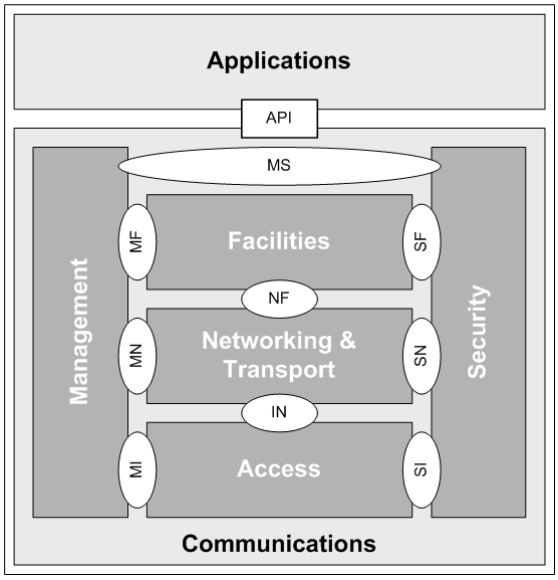

Figure 1: Simplified ITS station reference architecture

The OSI protocol layers of an ITS-S are grouped as shown in figure 1:

- The ITS-S access layer contains OSI layers 1 and 2, using the MI-interface towards the ITS-S management entity and the SI-interface towards the ITS-S security entity, and providing the IN-interface towards the ITS-S networking & transport layer.
- The ITS-S networking & transport layer contains OSI layers 3 and 4, using the MN-interface towards the ITS-S management entity, the SN-interface towards the ITS-S security entity, the IN-interface towards the ITS-S access layer, and providing the NF-interface towards the ITS-S facilities layer.
- The ITS-S facilities layer contains OSI layers 5, 6 and 7, using the MF-interface towards the ITS-S management entity, the SF-interface towards the ITS-S security entity and the NF-interface towards the ITS-S networking & transport layer.

There are further interfaces not presented in the simplified view of figure 1, i.e. the interfaces towards "Applications", which will be provided in an implementation by means of the API illustrated in figure 1.

The MI-interface, the MN-interface, the MF-interface, the SI-interface, the SN-interface, the SF-interface are specified in ISO 24102-3 [3] as service access points (SAPs). The IN-interface is described as an SAP in ISO 21218 [1].

In a distributed implementation of an ITS-S, management commands are exchanged between the ITS-SCUs by means of the "ITS station-internal management communications protocol" (IICP) specified in ISO 24102-4 [i.3]. Such management commands directly may carry functions of service primitives of SAPs to which they are addressed. By this, functions of the service primitives become observable as PDUs and thus testable. Consequently the present document indirectly provides also the foundations for testing functions of service primitives, but not the service primitives themselves.

The functionality of "ITS station-internal management communications" may be used to provide the upper tester access in the SUT as specified in ISO 24102-3 [3] and ETSI EG 202 798 [i.2] and in the present document.

Details of the ITS-S access layer, which are subject of the present document are illustrated in figure 2.

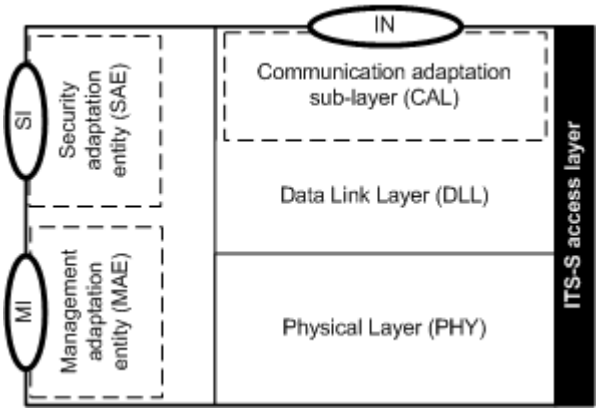

Figure 2: Illustration of the ITS-S access layer

1 Scope

The present document provides the test suite structure and test purposes (TSS & TP) specification for the protocols specified in ISO 21218 [1] in compliance with the relevant requirements, and in accordance with the relevant guidance given in ETSI TS 102 760-1 [2] and in ETSI EG 202 798 [i.2].

NOTE: ISO 21218 [1] cannot be tested without being applied to a specific CALM-compliant communication interface (CI). Conformance with ISO 21218 [1] thus always is restricted to the CALM-compliant CI declared in the ICS proforma ETSI TS 102 760-1 [2].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ISO 21218: "Intelligent Transport Systems - Communications access for land mobiles (CALM) - Access technology support".

[2] ETSI TS 102 760-1: "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218); Part 1: Implementation Conformance Statement (ICS) proforma".

[3] ISO 24102-3: "Intelligent Transport Systems - Communications access for land mobiles (CALM) - ITS station management - Part 3: Service access points".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ISO 21217:2014: "Intelligent Transport Systems - Communications access for land mobiles (CALM) - Architecture".

[i.2] ETSI EG 202 798: "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

[i.3] ISO 24102-4:2013: "Intelligent Transport Systems - Communications access for land mobiles (CALM) - ITS station management - Part 4: Station-internal management communication".

[i.4] ETSI TS 102 760-3: "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218); Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO 21218 [1], ISO 21217 [i.1], ISO 24102-3 [3], ISO 24102-4 [i.3], ETSI TS 102 760-1 [2] and ETSI EG 202 798 [i.2] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 21218 [1], ISO 21217 [i.1], ISO 24102-3 [3], ISO 24102-4 [i.3], ETSI TS 102 760 1 [2] and ETSI EG 202 798 [i.2] apply.

4 Test suite architecture

ISO 21218 [1] cannot be tested without being applied to a specific communication interface (CI) specified in ISO 21217 [i.1]. Thus the test architecture presented in figure 3 shows also the OSI communication layers PHY and DLL which are below the "Communication Adaptation Layer" (CAL), both in the system under test (SUT) and in the ITS lower layers of the ITS test system.

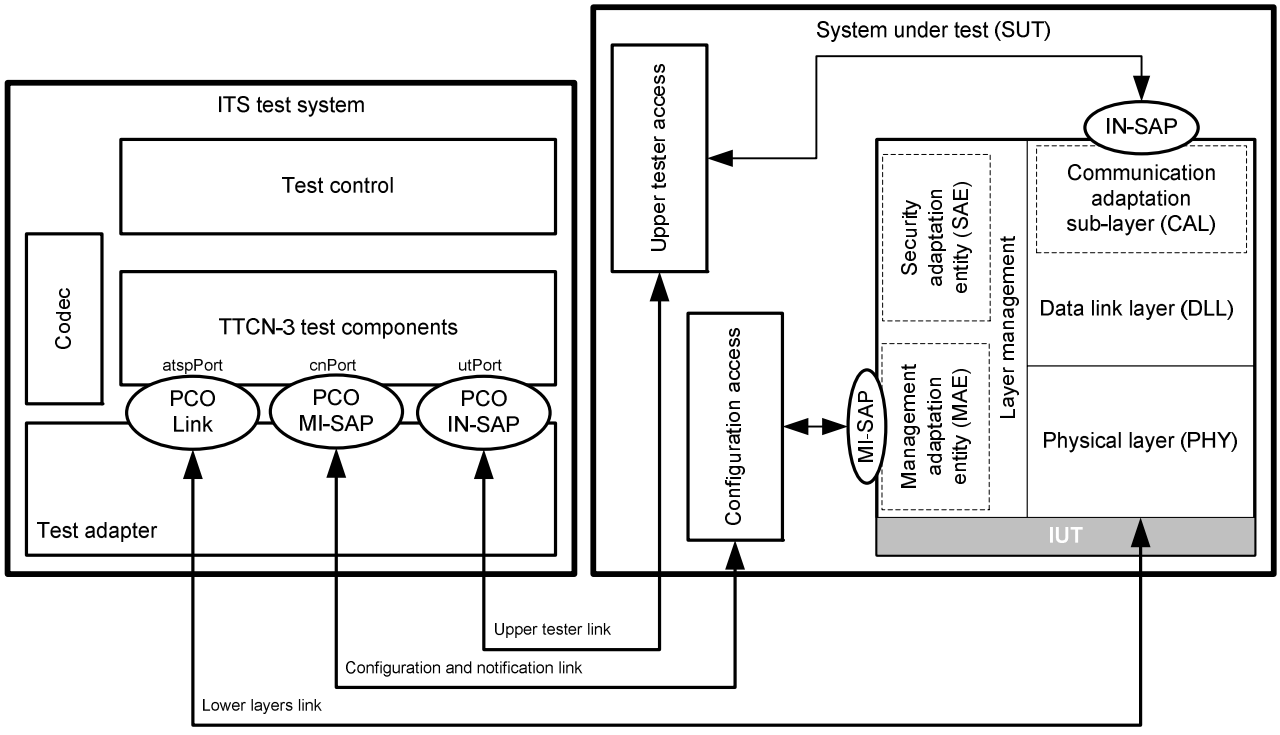

Figure 3: Test architecture

The IUT is connected via three points of control and observation (PCO) with the TTCN-3 test components:

- "PCO IN-SAP", providing access to the IN-SAP of the IUT;
- "PCO MI-SAP", providing access to the MI-SAP of the IUT;
- "PCO Link", the communication link.

Access to the MI-SAP and IN-SAP beneficially may be provided with the "ITS station-internal management communications protocol" (IICP) specified in ISO 24102-4 [i.3] as specified in ETSI TS 102 760-3 [i.4]. Alternative approaches for the upper tester access specified in ETSI EG 202 798 [i.2] also are possible.

NOTE: Not using IICP to access IM-SAP and MI-SAP may cause extra cost to the applicant in order to adapt the SUT to the test environment in a test house.

A SUT may contain several CIs. However in a given test at a given time, only a single of them together with the functionality of ISO 21218 [1] shall constitute the IUT. Testing of a SUT containing several CIs thus requires repetition of the tests for all CIs contained in the SUT.

Tests for a configuration with several active CIs in a single SUT are not considered in the present document.

5 TP basics

5.1 TP definition conventions

The TP definition is built according to the guidelines provided in the ITS testing framework ETSI EG 202 798 [i.2], applying a formalized language with pre-defined keywords for the behaviour description.

5.2 TP identifier naming conventions

The identifier of the TP is built according to table 1 as recommended in the ITS testing framework ETSI EG 202 798 [i.2].

Table 1: TP naming convention

TP/<group>/<x>/<n>		
group = Group of tests	SE	State event transitions
	MB	MIB I-Parameters
	HC	Handling of CIs
	DP	Handling of data plane
x = Type of testing	BV	Valid Behaviour Tests
	BI	Invalid Behaviour Tests
<nn> = sequential number	>0	Test Purpose Number, 01 .. 99

5.3 Rules for behaviour description

The description of the TP is built according to the guidelines provided in the ITS testing framework ETSI EG 202 798 [i.2].

5.4 Sources of TP definitions

All TPs are specified according to ISO 21218 [1].

5.5 TP proforma

ETSI EG 202 798 [i.2] proposes a TP proforma which is used in the present document. The fields of this proforma as used in the present document are explained in table 1.

Table 1: TP proforma field description

TP Header	
TP ID	The TP ID is a unique identifier according to the TP naming conventions in table 1.
Test objective	Short description of test purpose objective according to the requirements from the base standard.
Reference	The reference indicates the clauses of the reference standard specifications in which the conformance requirement is expressed.
PICS selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression. May contain PICS acronyms specified in table 2. This section is only used in case an optional or conditional behaviour needs to be selected. Mandatory behaviour is not identified here.
TP Behaviour	
Initial conditions (optional)	The initial conditions define in which initial state the IUT has to be to apply the actual TP. In the corresponding "Test Case" (TC), when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.
Expected behaviour (TP body)	Definition of the events, which are parts of the TP objective, the IUT is expected to perform in order to conform to the base specification. In the corresponding Test Case,"Pass" or "Fail" verdicts can be assigned there.
Final conditions (optional)	Definition of the events that the IUT is expected to perform or shall not perform, according to the base standard and following the correct execution of the actions in the expected behaviour above. In the corresponding Test Case, the execution of the final conditions is evaluated for the assignment of the final verdict.

The following initial conditions shall apply for all TPs, if not defined differently in a specific TP:

- The Link-ID of all CIs not being in the CI state "not_existent" and of all existent VCIs shall be known to the ITS test system, see figure 3.
- The MIB of the CI / VCI shall contain default values except for the I-Parameters ISO 21218 [1] listed below.
  - "MinimumUserPriority" shall be set to zero if not requested differently.

Additional initial conditions may apply for specific TPs.

According to ISO 24102-3 [3], the service primitives COMMAND.confirm and REQUEST.confirm shall be present in case of an error and may be omitted otherwise. The optional presence of confirm service primitives with ErrStatus indicating success are not explicitly included in the TPs, but will have to be considered in the abstract test suite, i.e. in part 3 [i.4] of this multi-part deliverable.

5.6 PICS mnemonics

The PICS mnemonics presented in table 2 are used in the TP proforma.

Table 2: PICS mnemonics

Mnemonic	PICS item	Explanation
PICS_ACT	ETSI TS 102 760-1 [2] C.11/4	
PICS_BCVCI	ETSI TS 102 760-1 [2] C.8/1	IUTis supporting BC-VCI transmitter
PICS_CIAC1	ETSI TS 102 760-1 [2] C.6/1	IUT is of CI access class CIAC-1 (no user authentication required, usage of CI is free of charge)
PICS_CIAC2	ETSI TS 102 760-1 [2] C.6/2	IUT is of CI access class CIAC-2 (access credentials required, usage of CI is subject of a service charge)
PICS_CIAC3	ETSI TS 102 760-1 [2] C.6/3	IUT is of CI access class CIAC-3 (access credentials required, usage of CI is free of charge)
PICS_CIC_il1	ETSI TS 102 760-1 [2] C.5/6	IUT is of CI class CIC-il1 (non-deterministic ITS station-internal network interface)
PICS_CIC_il2	ETSI TS 102 760-1 [2] C.5/7	IUT is of CI class CIC-il2 (deterministic ITS station-internal network interface)
PICS_CIC_l1	ETSI TS 102 760-1 [2] C.5/1	IUT is of CI class CIC-l1 (multiple simultaneous peer stations transceiver)
PICS_CIC_l2	ETSI TS 102 760-1 [2] C.5/2	IUT is of CI class CIC-l2 (single peer station transceiver)
PICS_CIC_l3	ETSI TS 102 760-1 [2] C.5/3	IUT is of CI class CIC-l3 (groupcast transmitter)
PICS_CIC_l4	ETSI TS 102 760-1 [2] C.5/4	IUT is of CI class CIC-l4 (broadcast receiver only)
PICS_CIC_l5	ETSI TS 102 760-1 [2] C.5/5	IUT is of CI class CIC-l5 (CEN / Japanese DSRC)
PICS_CONN	ETSI TS 102 760-1 [2] C.11/7	IUT is supporting the connection procedure
PICS_CRCIP_I	ETSI TS 102 760-1 [2] C.11/10	IUT is supporting the Cross-CI prioritization - interferer procedure
PICS_CRCIP_V	ETSI TS 102 760-1 [2] C.11/9	IUT is supporting the Cross-CI prioritization - victim procedure
PICS_DISCONN	ETSI TS 102 760-1 [2] C.11/8	IUT is supporting the disconnection procedure
PICS_DYNREG	ETSI TS 102 760-1 [2] C.1/1	Dynamic registration using the standardized registration procedure
PICS_INACT	ETSI TS 102 760-1 [2] C.11/3	IUT is supporting the inactivation procedure
PICS_INUDS	ETSI TS 102 760-1 [2] C.12/2	IUT is supporting the IN-UNITDATA-STATUS service
PICS_IPNO	ETSI TS 102 760-1 [2] C.24 any selected I-Parameter	IUT is supporting notification-only I-Parameters
PICS_IPRO	ETSI TS 102 760-1 [2] C.21 and C.22 any selected I-Parameter	IUT is supporting read-only I-Parameters
PICS_IPRW	ETSI TS 102 760-1 [2] C.19 and C.20 any selected I-Parameter	IUT is supporting read/write I-Parameters
PICS_IPWO	ETSI TS 102 760-1 [2] C.23 any selected I-Parameter	IUT is supporting write-only I-Parameters
PICS_MAC48	ETSI TS 102 760-1 [2] C.4/1	IUT uses 48 bit MAC addresses
PICS_MCVCI	ETSI TS 102 760-1 [2] C.8/2	IUT is supporting MC-VCI transmitter
PICS_REJECT	ETSI TS 102 760-1 [2] C.11/20	IUT is supporting rejection of DL-UNITDATA.requests with user priority less than given in parameter "MinimumUserPriority"
PICS_RES	ETSI TS 102 760-1 [2] C.11/6	IUT is supporting the resuming procedure
PICS_RIM	ETSI TS 102 760-1 [2] C.11/12	IUT is supporting the Regulatory Information Management procedure
PICS_SNAP	ETSI TS 102 760-1 [2] C.13/1	IUT is supporting SNAP
PICS_SUSP	ETSI TS 102 760-1 [2] C.11//5	IUT is supporting the suspension procedure
PICS_UCVCI	ETSI TS 102 760-1 [2] C.8/3	IUT is supporting UC-VCI (transmitter and receiver)

Mnemonic	PICS item	Explanation
PICS_WAKEUP	ETSI TS 102 760-1 [2] C.15/4	IUT is supporting the WakeUp command
PICS_IN_UNITDATA_STATUS	ETSI TS 102 760-1 [2] C.12/2	IUT is supporting the IN-UNITDATA-STATUS service primitive
PICS_MONITOR	ETSI TS 102 760-1 [2] C.15/11	IUT is supporting the MONITOR command

6 Test purposes

6.1 CI state transitions

6.1.1 Valid behaviour tests

TP ID	SE/BV/01
Test objective	IUT with CI supporting 48-bit MAC addresses registers correctly at the management entity
Reference	ISO 21218 [1], clause 6.4.2
PICS Selection	PICS_DYNREG AND PICS_MAC48
Initial conditions	

with {
the IUT being in the CI state "not-existent"
}	

Expected behaviour	

ensure that {
when {
the IUT starts operation
}
then {
the IUT registers properly at the ITS-S management
}
}	

Final conditions	

ensure that {
when {
the IUT presented the state "registered" to the ITS-S management
}
then {
the IUT has a LocalCIID representing the 48 bit MAC address of the IUT
}
}	

TP ID	SE/BV/02
Test objective	IUT with CI not supporting 48-bit MAC addresses registers correctly at the management entity
Reference	ISO 21218 [1], clause 6.4.2
PICS Selection	PICS_DYNREG AND NOT PICS_MAC48
Initial conditions	

with {
the IUT being in the CI state "not-existent"
}	

Expected behaviour	

ensure that {
when {
the IUT starts operation
}
then {
the IUT registers properly at the ITS-S management
}
}	

Final conditions	

ensure that {
when {
the IUT presented the state "registered" to the ITS-S management
}
then {
the IUT has a LocalCIID created from ITS-SCU-ID and MedID
}
}	

TP ID	SE/BV/03
Test objective	IUT repeats registration as long as management entity does not confirm it
Reference	ISO 21218 [1], clause 6.4.2
PICS Selection	PICS_DYNREG
Initial conditions	

with {
the IUT being in the CI state "not-existent
}	

Expected behaviour	

ensure that {
when {
the IUT starts operation
}
then {
the IUT repeats continuously the registration procedure as long as the ITS-S management does not confirm with MI-COMMAND "RegCmd".
}
}	

TP ID	SE/BV/04
Test objective	IUT with CI class "CIC-I2" automatically creates a UC-VCI and reaches the CI state "active"
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	PICS_CIC_I2
Initial conditions	

with {
the IUT being in the CI state "registered"
}	

Expected behaviour	

ensure that {
when {
the IUT has finished the registration procedure
}
then {
the IUT creates a UC-VCI
}
}	

Final conditions	

ensure that {
when {
the IUT created a UC-VCI
}
then {
the IUT is in the state "active"
}
}	

TP ID	SE/BV/05
Test objective	IUT with CI class "CIC-I3" automatically creates a BC-VCI and reaches the CI state "active"
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	PICS_CIC_I3
Initial conditions	

with {
the IUT being in the CI state "registered", and MAC multicast groups are not known to the IUT
}	

Expected behaviour	

ensure that {
when {
the IUT has finished the registration procedure
}
then {
the IUT creates a BC-VCI
}
}	

Final conditions	

ensure that {
when {
the IUT created a BC-VCI
}
then {
the IUT is in the state "active"
}
}	

TP ID	SE/BV/06
Test objective	IUT with CI class "CIC-l4" automatically creates a RX-VCI and reaches the CI state "active"
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	PICS_CIC_l4
Initial conditions	

with {
the IUT being in the CI state "registered"
}	

Expected behaviour	

ensure that {
when {
the IUT has finished the registration procedure
}
then {
the IUT creates a RX-VCI
}
}	

Final conditions	

ensure that {
when {
the IUT created a RX-VCI
}
then {
the IUT is in the state "active"
}
}	

TP ID	SE/BV/07
Test objective	IUT with CI class "CIC-l1"or "CIC-il1" automatically creates a UC-VCI and a BC-VCI and reaches the CI state "active"
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	PICS_CIC_l1 OR PICS_CIC_il1
Initial conditions	

with {
the IUT being in the CI state "registered", and MAC multicast groups are not known to the IUT
}	

Expected behaviour	

ensure that {
when {
the IUT has finished the registration procedure
}
then {
the IUT creates a UC-VCI and a BC-VCI
}
}	

Final conditions	

ensure that {
when {
the IUT created a UC-VCI and a BC-VCI
}
then {
the IUT is in the state "active"
}
}	

TP ID	SE/BV/08
Test objective	IUT with CI class "CIC-I3" automatically creates a BC-VCI and known MC-VCIs and reaches the CI state "active"
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	PICS_CIC_I3 AND PICS_MCVCI
Initial conditions	

with {
the IUT being in the CI state "registered", and at least one MAC multicast group is known to the IUT
}	

Expected behaviour	

ensure that {
when {
the IUT has finished the registration procedure
}
then {
the IUT creates a BC-VCI and a MC-VCI for each known MAC multicast group
}
}	

Final conditions	

ensure that {
when {
the IUT created a BC-VCI and the MC-VCI(s)
}
then {
the IUT is in the state "active"
}
}	

TP ID	SE/BV/09
Test objective	IUT with CI class "CIC-I1" or "CIC-iI1" automatically creates a UC-VCI and a BC-VCI and known MC-VCIs and reaches the CI state "active"
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	(PICS_CIC_I1 OR PICS_CIC_iI1) AND PICS_MCVCI
Initial conditions	

with {
the IUT being in the CI state "registered", and at least one MAC multicast group is known to the IUT
}	

Expected behaviour	

ensure that {
when {
the IUT has finished the registration procedure
}
then {
the IUT creates a UC-VCI and a BC-VCI and the MC-VCI(s)
}
}	

Final conditions	

ensure that {
when {
the IUT created a UC-VCI and a BC-VCI and the MC-VCIs
}
then {
the IUT is in the state "active"
}
}	

TP ID	SE/BV/10
Test objective	IUT deregisters correctly from the management entity
Reference	ISO 21218 [1], clause 6.4.3
PICS Selection	PICS_DYNREG
Initial conditions	

with {
the IUT being in the CI state different to "existent" or "not_existent"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "deregister"
}
then {
the IUT performs deregistration
}
}	

Final conditions	

ensure that {
when {
the IUT deregistered
}
then {
the IUT no more is addressable by the ITS-S management entity
}
}	

TP ID	SE/BV/11
Test objective	IUT performs inactivation
Reference	ISO 21218 [1], clause 6.4.4
PICS Selection	PICS_INACT
Initial conditions	

with {
the IUT being in the CI state "active" or "connected" or "suspended"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "inactivate"
}
then {
the IUT performs inactivation
}
}	

Final conditions	

ensure that {
when {
the IUT performed inactivation
}
then {
the IUT no more has VCIs
}
}	

TP ID	SE/BV/12
Test objective	IUT performs activation
Reference	ISO 21218 [1], clause 6.4.5
PICS Selection	PICS_ACT
Initial conditions	

with {
the IUT being in the CI state "inactive"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "activate"
}
then {
the IUT performs activation, i.e. reaches the CI state "registered"
}
}	

TP ID	SE/BV/13
Test objective	IUT performs suspension
Reference	ISO 21218 [1], clause 6.4.6
PICS Selection	PICS_SUSP
Initial conditions	

with {
the IUT being in the CI state "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "suspend"
}
then {
the IUT performs suspension
}
}	

Final conditions	

ensure that {
when {
the IUT performed suspension
}
then {
the IUT still accepts new transmission requests at the IN-SAP, without performing the transmission
}
}	

TP ID	SE/BV/14
Test objective	IUT performs resuming
Reference	ISO 21218 [1], clause 6.4.7
PICS Selection	PICS_RES
Initial conditions	

with {
the IUT being in the CI state "suspended"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "resume"
}
then {
the IUT performs resuming
}
}	

Final conditions	

ensure that {
when {
the IUT performed resuming
}
then {
the IUT starts transmission of pending packets
}
}	

TP ID	SE/BV/15
Test objective	IUT of CIC-l2 and CIAC-2 performs connection manually
Reference	ISO 21218 [1], clause 6.4.8
PICS Selection	PICS_CIC_l2 AND PICS_CIAC2
Initial conditions	

with {
the IUT being in the CI state "active",
valid access information in I-Parameters "SIMpin", "ProviderInfo" is present,
the IUT is exposed to the signals of a related base station,
I-Parameter Connect is set to "manual"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CONcmd"
}
then {
the IUT performs connection
}
}	

TP ID	SE/BV/16
Test objective	IUT CIC-I2 performs connection automatically
Reference	ISO 21218 [1], clause 6.4.8
PICS Selection	PICS_CIC_I2
Initial conditions	

with {
the IUT being in the CI state "active",
valid access information in I-Parameters "SIMpin", "ProviderInfo" is present,
the IUT is not exposed to the signals of a related base station,
I-Parameter Connect is set to "automatic"
}	

Expected behaviour	

ensure that {
when {
the IUT is exposed to the signal of a related base station
}
then {
the IUT performs connection
}
}	

TP ID	SE/BV/17
Test objective	IUT performs disconnection
Reference	ISO 21218 [1], clause 6.4.9
PICS Selection	PICS_DISCONN
Initial conditions	

with {
the IUT being in the CI state "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "disconnect"
}
then {
the IUT performs disconnection
}
}	

Final conditions	

ensure that {
when {
the IUT performed disconnection
}
then {
the IUT is in the CI state "active"
}
}	

6.1.2 Invalid behaviour tests

TP ID	SE/BI/01
Test objective	IUT rejects an invalid CI state transition request
Reference	ISO 21218 [1], clause 6.4.10
PICS Selection	PICS_DYNREG OR PICS_INACT OR PICS_ACT OR PICS_SUSP OR PICS_RES OR PICS_CONN OR PICS_DISCONN
Initial conditions	

with {
the IUT being in any CI state except the CI state "existent"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "CIstateChng" with an invalid value of CIstatus
}
then {
the IUT acknowledges with error code "INVALID COMMAND/REQUEST VALUE"
}
}	

Final conditions	

ensure that {
when {
the IUT acknowledged with error code "INVALID COMMAND/REQUEST VALUE"
}
then {
the IUT is still in the initial CI state.
}
}	

TP ID	SE/BI/02
Test objective	IUT ignores a connect request with missing access information
Reference	ISO 21218 [1], clause 6.4.8 and clause 6.2.2
PICS Selection	(PICS_CIAC2 OR PICS_CIAC3) AND PICS_CONN
Initial conditions	

with {
the IUT being in the CI state "active",
I-Parameter "Connect" is set to "manual",
no access information in I-Parameters "SIMpin", "ProviderInfo" is present
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "CONcmd" with value "connect"
}
then {
the IUT acknowledges with error code "INVALID COMMAND/REQUEST VALUE"
}
}	

Final conditions	

ensure that {
when {
the IUT acknowledged with error code "INVALID COMMAND/REQUEST VALUE"
}
then {
the IUT is still in the CI state "active".
}
}	

6.2 MIB parameters

6.2.1 Valid behaviour tests

TP ID	MB/BV/01
Test objective	IUT correctly reads I-Parameters with Read/Write access or Read-only access
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	PICS_IPRW OR PICS_IPRO
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-GET command for a supported I-Parameter with Read/Write access or Read-only access
}
then {
the IUT reports the proper value of this I-Parameter
}
}	

TP ID	MB/BV/02
Test objective	IUT correctly writes I-Parameters with Read/Write access or Write-only access
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	PICS_IPRW OR PICS_IPWO
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-SET command for a supported I-Parameter with Read/Write access
}
then {
the IUT accepts the new value of this I-Parameter
}
}	

TP ID	MB/BV/03
Test objective	IUT correctly monitors change of value of I-Parameters
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	PICS_IPRW OR PICS_IPRO OR PICS_IPNO
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "Monitor" to activate monitoring of value changes for a supported I-Parameter
}
then {
the IUT reports automatically all value changes of this I-Parameter with MI-REQUEST "Events(E21218-5)"
}
}	

6.2.2 Invalid behaviour tests

TP ID	MB/BI/01
Test objective	IUT correctly acknowledges MI-GET requests to non-existent I-Parameters
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-GET command for an I-Parameter which is not existent
}
then {
the IUT acknowledges with error code "INVALID PARAMETER NUMBER"
}
}	

TP ID	MB/BI/02
Test objective	IUT correctly acknowledges MI-SET requests to non-existent I-Parameters
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-SET command for an I-Parameter which is not existent
}
then {
the IUT acknowledges with error code "INVALID PARAMETER NUMBER"
}
}	

TP ID	MB/BI/03
Test objective	IUT correctly acknowledges MI-SET requests to I-Parameters with Read-only access or Notify-only access
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	PICS_IPRO OR PICS_IPNO
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-SET command for an I-Parameter with Read-only or Notify-only access
}
then {
the IUT acknowledges with error code "ACCESS VIOLATION"
}
}	

6.3 Handling of CIs

6.3.1 Valid behaviour tests

TP ID	HC/BV/01
Test objective	IUT correctly handles COMMAND "WakeUp"
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	PICS_WAKEUP
Initial conditions	

with {
the IUT being in the CI state "active"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "WakeUp"
}
then {
the IUT periodically sends out wake-up messages
}
}	

TP ID	HC/BV/02
Test objective	IUT correctly handles COMMAND "RIcmd"
Reference	ISO 21218 [1], clause 9 and annex A
PICS Selection	PICS_RIM
Initial conditions	

with {
the IUT being in anyCI state except "not_existent" or "existent"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "RIcmd"
}
then {
the IUT accepts the new regulatory information
}
}	

TP ID	HC/BV/03
Test objective	IUT correctly handles COMMAND "VCIcmd" to reset a VCI
Reference	ISO 21218 [1], clause 7.3.2
PICS Selection	
Initial conditions	

with {
the IUT being in the CI state "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "VCIcmd" requesting to reset a VCI
}
then {
the IUT resets the selected VCI
}
}	

TP ID	HC/BV/04
Test objective	IUT correctly handles COMMAND "VCIcmd" to delete a VCI
Reference	ISO 21218 [1], clause 7.3.3
PICS Selection	
Initial conditions	

with {
the IUT being in any CI state except "not_existent" or "existent" or "registered"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "VCIcmd" requesting deletion of a VCI
}
then {
the IUT deletes the selected VCI
}
}	

TP ID	HC/BV/05
Test objective	IUT correctly handles COMMAND "VCIcmd" to create a VCI
Reference	ISO 21218 [1], clause 7.3.1
PICS Selection	
Initial conditions	

with {
the IUT being in any CI state except "not_existent" or "existent" or "registered"
}	

Expected behaviour	

ensure that {
when {
the IUT receives the MI-COMMAND "VCIcmd" requesting creation of a new VCI
}
then {
the IUT creates a new VCI
}
}	

6.3.2 Invalid behaviour tests

TP ID	HC/BI/01
Test objective	IUT correctly handles invalid MI-COMMAND
Reference	ISO 21218 [1], clause 9
PICS Selection	
Initial conditions	

with {
the IUT being in any CI state except "not_existent" or "existent"
}	

Expected behaviour	

ensure that {
when {
the IUT receives an invalid MI-COMMAND
}
then {
the IUT acknowledges with error code "INVALID COMMAND/REQUEST NUMBER"
}
}	

6.4 Handling of data plane

6.4.1 Valid behaviour tests

TP ID	DP/BV/01
Test objective	IUT correctly handles an IN-UNITDATA transmission request with MAC broadcast address
Reference	ISO 21218 [1], clause 8.3.1
PICS Selection	(PICS_MAC48 AND PICS_BCVCI) AND NOT PICS_CIC_l4 AND NOT PICS_CIC_l5
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
 	
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request for transmission of a packet to a MAC broadcast address
}
then {
the BC-VCI of the IUT correctly performs transmission of the corresponding frame
}
}	

TP ID	DP/BV/02
Test objective	IUT correctly handles an IN-UNITDATA transmission request with MAC multicast address
Reference	ISO 21218 [1], clause 8.3.1
PICS Selection	(PICS_MAC48 AND PICS_MCVCI) AND NOT PICS_CIC_l4 AND NOT PICS_CIC_l5
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
a MC_VCI is available
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request for transmission of a packet to a known MAC multicast address
}
then {
the MC-VCI of the IUT correctly performs transmission of the corresponding frame
}
}	

TP ID	DP/BV/03
Test objective	IUT correctly handles an IN-UNITDATA transmission request with MAC unicast address
Reference	ISO 21218 [1], clause 8.3.1
PICS Selection	(PICS_MAC48 AND PICS_UCVCI) AND NOT PICS_CIC_l4 AND NOT PICS_CIC_l5
Initial conditions	

with {
the IUT being in the CI state "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request for transmission of a packet to a known MAC unicast address
}
then {
the UC-VCI of the IUT correctly performs transmission of the corresponding frame
}
}	

TP ID	DP/BV/04
Test objective	IUT correctly handles an IN-UNITDATA notification for reception of a broadcast frame
Reference	ISO 21218 [1], clause 8.3.2
PICS Selection	PICS_MAC48 AND NOT PICS_CIC_I5
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a frame addressed to a MAC broadcast address
}
then {
the IUT correctly notifies reception with IN-UNITDATA.indication
}
}	

Final conditions	

ensure that {
when {
the IUT notified the received frame
}
then {
creates a UC-VCI related to the transmitter of the received frame,
the IUT is in the CI state "connected".
}
}	

TP ID	DP/BV/05
Test objective	IUT correctly handles an IN-UNITDATA notification for reception of a multicast frame
Reference	ISO 21218 [1], clause 8.3.2
PICS Selection	PICS_MAC48 AND NOT PICS_CIC_I5
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a frame addressed to a MAC multicast address
}
then {
the IUT correctly notifies reception with IN-UNITDATA.indication
}
}	

Final conditions	

ensure that {
when {
the IUT notified the received frame
}
then {
creates a UC-VCI related to the transmitter of the received frame,
the IUT is in the CI state "connected".
}
}	

TP ID	DP/BV/06
Test objective	IUT correctly handles an IN-UNITDATA notification for reception of a unicast frame
Reference	ISO 21218 [1], clause 8.3.2
PICS Selection	PICS_MAC48 AND NOT PICS_CIC_I5
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT receives a frame addressed to the MAC unicast address of the CI of the IUT
}
then {
the IUT correctly notifies reception with IN-UNITDATA.indication
}
}	

Final conditions	

ensure that {
when {
the IUT notified the received frame
}
then {
creates a UC-VCI related to the transmitter of the received frame,
the IUT is in the CI state "connected".
}
}	

TP ID	DP/BV/07
Test objective	IUT correctly handles prioritization
Reference	ISO 21218 [1], clause 6.4.6, clause 7.1 and clause 8.4
PICS Selection	PICS_MAC48 AND NOT PICS_CIC_I4 AND PICS_SUSP AND PICS_RES
Initial conditions	

with {
the IUT being in the CI state "suspended",
the IUT has three pending IN-UNITDATA transmission request with three different priority values, i.e. a broadcast request with priority 255, a multicast request with priority 100 and a unicast request with priority zero
}	

Expected behaviour	

ensure that {
when {
the IUT receives the COMMAND "CIstateChng" with the value "resume"
}
then {
the IUT correctly performs transmission of frames related to the three pending transmission requests in the sequence with highest priority first
}
}	

TP ID	DP/BV/08
Test objective	IUT correctly registers for the cross-CI prioritization victim procedure
Reference	ISO 21218 [1], clause 6.4.11.2
PICS Selection	PICS_CRCIP_V
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
}	

Expected behaviour	

ensure that {
when {
the IUT needs to register for cross-CI prioritization as a potential victim of interference
}
then {
the IUT presents MI-REQUEST "PrioReg"
}
}	

TP ID	DP/BV/09
Test objective	IUT correctly requests prioritization and gets prioritization
Reference	ISO 21218 [1], clause 6.4.11.3 and clause 6.4.11.4
PICS Selection	PICS_CRCIP_V
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
the IUT being registered for cross-CI prioritization
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request with priority value of at least equal to the value of the I-Parameter "MinPrioCrossCI"
}
then {
the IUT presents the prioritization request MI-REQUEST "RTSreq"
}
}	

Final conditions	

ensure that {
when {
the IUT received an MI-COMMAND "RTSackCmd" granting prioritization
}
then {
the IUT sends the pending packet,
the IUT releases the prioritization request with MI-REQUEST "RTSreq"
}
}	

TP ID	DP/BV/10
Test objective	IUT correctly requests prioritization but does not get prioritization
Reference	ISO 21218 [1], clause 6.4.11.3 and clause 6.4.11.4
PICS Selection	PICS_CRCIP_V
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
the IUT being registered for cross-CI prioritization
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request with priority value of at least equal to the value of the I-Parameter "MinPrioCrossCI"
}
then {
the IUT presents the prioritization request MI-REQUEST "RTSreq"
}
}	

Final conditions	

ensure that {
when {
the IUT received an MI-COMMAND "RTSackCmd" ignoring prioritization
}
then {
the IUT releases the prioritization request with MI-REQUEST "RTSreq"
}
}	

TP ID	DP/BV/11
Test objective	IUT correctly requests prioritization but does not get prioritization within timeout
Reference	ISO 21218 [1], clause 6.4.11.3 and clause 6.4.11.4
PICS Selection	PICS_CRCIP_V
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
the IUT being registered for cross-CI prioritization
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request with priority value of at least equal to the value of the I-Parameter "MinPrioCrossCI"
}
then {
the IUT presents the prioritization request MI-REQUEST "RTSreq"
}
}	

Final conditions	

ensure that {
when {
the T_DummyAckReq timer expired
}
then {
the IUT releases the prioritization request with MI-REQUEST "RTSreq"
}
}	

TP ID	DP/BV/12
Test objective	IUT correctly transmits a packet without requesting prioritization
Reference	ISO 21218 [1], clause 6.4.11.3
PICS Selection	PICS_CRCIP_V
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
the IUT being registered for cross-CI prioritization
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request with priority value less than the value of the I-Parameter "MinPrioCrossCI"
}
then {
the IUT sends the packet without presenting MI-REQUEST "RTSreq"
}
}	

TP ID	DP/BV/13
Test objective	IUT correctly grants prioritization
Reference	ISO 21218 [1], clause 6.4.11.5
PICS Selection	PICS_CRCIP_I
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
there are no pending packets in the CI
}	

Expected behaviour	

ensure that {
when {
the IUT receives an MI-COMMAND "RTScmd" requesting to grant prioritization to another CI
}
then {
the IUT presents MI-REQUEST "RTSackReq" granting prioritization
}
}	

TP ID	DP/BV/14
Test objective	IUT correctly postpones transmission of pending packets after granting prioritization
Reference	ISO 21218 [1], clause 6.4.11.5
PICS Selection	PICS_CRCIP_I
Initial conditions	

with {
the IUT being in the CI state "active" or "connected",
the IUT having granted prioritization to another CI
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request
}
then {
the IUT sends the packet only upon reception of MI-COMMAND "RTScmd" releasing prioritization, or upon timeout of T_dummyAckGrant
}
}	

6.4.2 Invalid behaviour tests

TP ID	DP/BI/01
Test objective	IUT correctly handles the minimum priority "MinimumUserPriority" and notifies this in an IN-UNITDATA-STATUS.indication service primitive
Reference	ISO 21218 [1], clause 8.3.3 and clause 8.4
PICS Selection	PICS_INUDS AND NOT PICS_CIC_I4
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
I-Parameter "MinimumUserPriority" is set to a value greater than zero and less than 255
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request with priority value less than the value of the I-Parameter "MinimumUserPriority"
}
then {
the IUT presents MI-REQUEST "Events" with value "E21218-0",
the IUT presents IN-UNITDATA-STAUS.indication with transmission_status "PRIORITY"
the IUT deletes the packet without sending it
}
}	

TP ID	DP/BI/02
Test objective	IUT correctly handles the minimum priority "MinimumUserPriority"
Reference	ISO 21218 [1], clause 8.3.3 and clause 8.4
PICS Selection	NOT PICS_CIC_I4
Initial conditions	

with {
the IUT being in the CI state "active" or "connected"
I-Parameter "MinimumUserPriority" is set to a value greater than zero and less than 255
}	

Expected behaviour	

ensure that {
when {
the IUT receives an IN-UNITDATA.request with priority value less than the value of the I-Parameter "MinimumUserPriority"
}
then {
the IUT presents MI-REQUEST "Events" with value "E21218-0",
the IUT deletes the packet without sending it
}
}	

History

Document history		
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