



**Core Network and Interoperability Testing (INT);
5G NAS Conformance Testing for the N1 interface;
(3GPP™ Release 16);
Part 3: Abstract Test Suite (ATS) and partial Protocol
Implementation eXtra Information for Testing (PIXIT)
pro forma specification**

Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Core Network and Interoperability Testing (INT).

The present document is part 3 of a multi-part deliverable. Full details of the entire series can be found in part 1 [2].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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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1 Scope

The present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) pro forma for the test specification for the 5G NAS protocol on the N1 interface as specified in ETSI TS 124 501 [1] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [i.2] and ETSI ETS 300 406 [5].

The test notation used in the ATS is TTCN-3 (see ETSI ES 201 873-1 [6]).

The following test specification and design considerations can be found in the body of the present document:

- the overall test suite structure;
- the testing architecture;
- the test methods and port definitions;
- the test configurations;
- TTCN styles and conventions;
- the partial PIXIT pro forma;
- the modules containing the TTCN-3 ATS.

Annex A provides the Partial Implementation Extra Information for Testing (PIXIT) Pro forma.

Annex B provides the Abstract Test Suite (ATS) part of the ATS.

2 References

2.1 Normative 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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found in the [ETSI docbox](#).

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

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

- [1] [ETSI TS 124 501 \(V16.14.0\)](#): "5G; Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3 (3GPP TS 24.501 version 16.14.0 Release 16)".
- [2] [ETSI TS 103 921-1](#): "Core Network and Interoperability Testing (INT); 5G NAS Conformance Testing for the N1 interface; (3GPPTM Release 16); Part 1: Protocol Implementation Conformance Statement (PICS)".
- [3] [ETSI TS 103 921-2](#): "Core Network and Interoperability Testing (INT); 5G NAS Conformance Testing for the N1 interface; (3GPPTM Release 16); Part 2: Test Suite Structure (TSS) and Test Purposes (TP)".
- [4] [ISO/IEC 9646-6](#): "Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 6: Protocol profile test specification".
- [5] [ETSI ETS 300 406](#): "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

- [6] [ETSI ES 201 873-1](#): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".
- [7] [ETSI TS 123 501](#): "5G; System architecture for the 5G System (5GS) (3GPP TS 23.501)".

2.2 Informative 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 referenced document (including any amendments) applies.

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

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/IEC 9646-1](#): "Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts".
- [i.2] [ISO/IEC 9646-7](#): "Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 7: Implementation Conformance Statements".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ISO/IEC 9646-7 [i.2] and ETSI TS 124 501 [1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ISO/IEC 9646-1 [i.1], ISO/IEC 9646-6 [4], ISO/IEC 9646-7 [i.2] and ETSI TS 124 501 [1] apply.

4 Abstract Test Method (ATM)

4.1 Introduction

This clause describes the ATM used to test the 5G NAS protocol on the N1 interface at the UE and AMF side.

4.2 Test architecture

4.2.1 Test method

Void.

4.2.2 Test machine configuration

4.2.2.1 Test configurations using N2/N1 interface

The N1 interface is located between the UE and the AMF. Following configurations are simplified to highlight tested interface and involved entities.

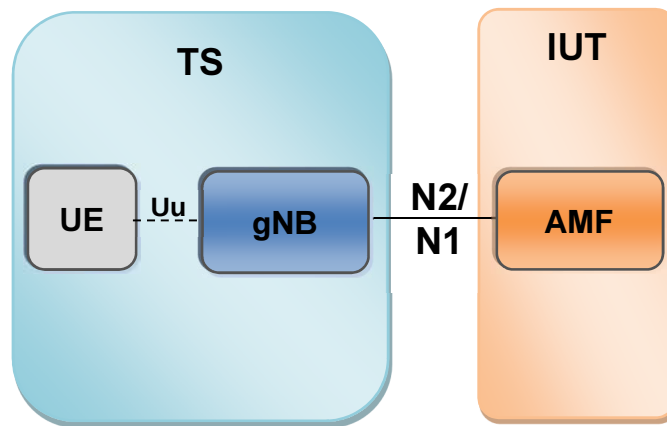


Figure 1: Test configuration CF_AMF_N2N1

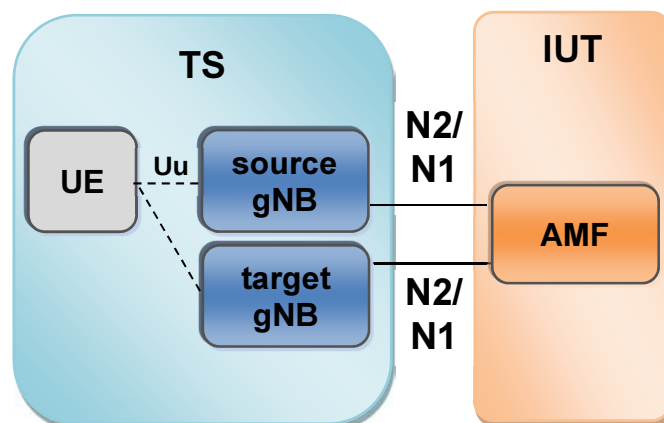


Figure 2: Test configuration CF_AMF_2N2N1

4.2.3 Interconnection of TS and SUT

4.2.3.1 AMF Role

If SUT has the role of AMF figure 3 shows the interconnection of TS and SUT in terms of signalling message flows. NGAP with 5G NAS messages are transferred over the N2 port.

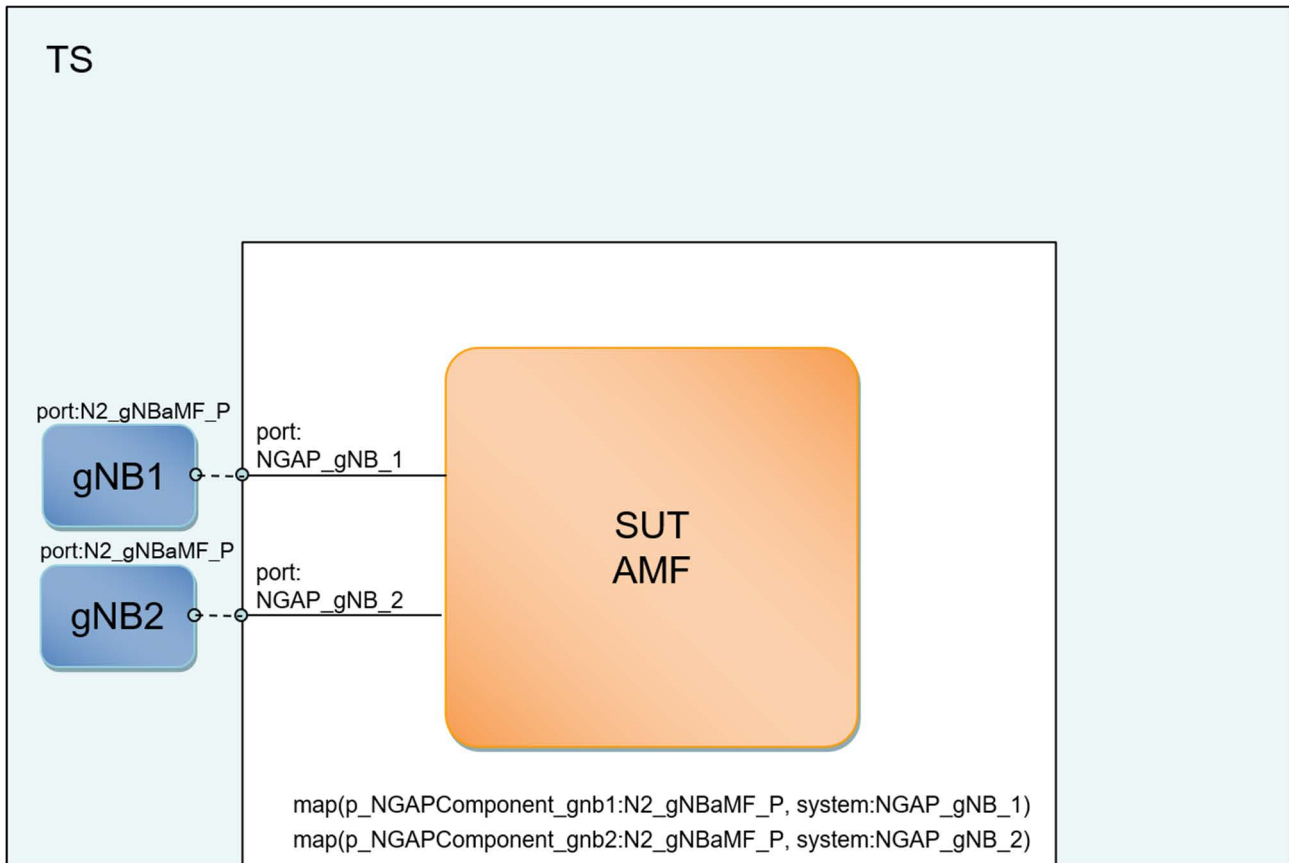


Figure 3: Interconnection for AMF role

5 ATS conventions

5.1 Introduction

The ATS conventions are intended to give a better understanding of the ATS but they also describe the conventions made for the development of the ATS. These conventions shall be considered during any later maintenance or further development of the ATS.

The ATS conventions contain two clauses, the testing conventions and the naming conventions. The naming conventions describe the structure of the naming of all ATS elements.

To define the ATS, the guidelines of ETSI ETS 300 406 [5] were considered.

5.2 Testing conventions

5.2.1 Test cases Preamble and Postamble

As described in the test method clause the test tool shall behave as an gNB that tunnels NAS messages from UEs over gNB encapsulated to the AMF. The test case preambles and postambles are named as follows:

IUT is a NGAP with 5G NAS/AMF (example TC_5GNAS_AMF_REG_01)

f_NGAP_init

5.3 Naming conventions

5.3.1 General guidelines

The naming conventions are based on the following underlying principles:

- In most cases, identifiers should be prefixed with a short alphabetic string (specified in table 1) indicating the type of TTCN-3 element it represents.
- Suffixes should not be used except in those specific cases identified in table 1.
- Prefixes and suffixes should be separated from the body of the identifier with an underscore ("_").

EXAMPLE 1: `c_sixteen`, `t_wait_max`.

- Only module names, data type names and module parameters should begin with an upper-case letter. All other names (i.e. the part of the identifier following the prefix) should begin with a lower-case letter.
- The start of second and subsequent words in an identifier should be indicated by capitalizing the first character. Underscores should not be used for this purpose.

EXAMPLE 2: `f_authenticateUser`.

Table 1 specifies the naming guidelines for each element of the TTCN-3 language indicating the recommended prefix, suffixes (if any) and capitalization.

Table 1: TTCN-3 naming convention

Language element	Naming convention	Prefix	Suffix	Example	Notes
Module	Use upper-case initial letter	5GNAS_	<i>none</i>	5GNAS_Steps	
TSS grouping	Use all upper-case letters	<i>none</i>	<i>none</i>	TP_5GNAS_AMF_PDU	
Message template	Use lower-case initial letter	m_	<i>none</i>	m_E_PDUSetupRequest	
Message template with wildcard or matching expression	Use lower-case initial letters	mw_	<i>none</i>	mw_cause	
Port instance	Use upper-case initial letter	<i>none</i>	<i>none</i>	NGAPPort	
Constant	Use lower-case initial letter	c_	<i>none</i>	c_maxRetransmission	
Function	Use lower-case initial letter	f_	<i>none</i>	f_authentication()	
Altstep	Use lower-case initial letter	a_	<i>none</i>	a_receive()	
Variable	Use lower-case initial letter	v_	<i>none</i>	v_basicId	
PICS values	Use all upper case letters	PICS_	<i>none</i>	PICS_5GNAS_AMF_	See note
PIXIT values	Use all upper case letters	PX_	<i>none</i>	PX_5GNAS_	See note
Parameterization	Use lower-case initial letter	p_	<i>none</i>	p_macId	
Enumerated Value	Use lower-case initial letter	e_	<i>none</i>	e_synCpk	
NOTE: In this case it is acceptable to use underscore as a word delimiter.					

5.3.2 Test case grouping

The ATS structure is based on the Test Purposes for the 5G NAS protocol on the N1 interface as defined in ETSI TS 103 921-2 [3].

5.3.3 Test case identifiers

The test cases have been divided according to the functionalities into several groups.

The test case names are built up according to the following scheme.

Table 2: TC identifier naming convention scheme

Identifier: <TC>_<iut>_<scope>_<nn>			
<tp>	=	Test Case:	fixed to "TC"
<interface>		Interface or protocol:	5G NAS
<iut>	=	type of IUT:	AMF
<scope1>	=	group1	AUT 5GMM / Authentication procedure SEC 5GMM / Security mode control procedure IDN 5GMM / Identification procedure CON 5GMM / Generic UE configuration update procedure ULN 5GMM / Uplink NAS transport procedure DLN 5GMM / Downlink NAS transport procedure EST 5GMM / EMM Status NSA 5GMM / Network slice-specific authentication and authorization procedure REG 5GMM / Registration procedure DRG 5GMM / De-registration procedure SRV 5GMM / Service request procedure PAG 5GMM / Paging procedure NOT 5GMM / Notification procedure NPE 5GSM / Network-requested PDU session establishment procedure NPM 5GSM / Network-requested PDU session modification procedure NPR 5GSM / Network-requested PDU session release procedure UPE 5GSM / UE requested PDU session establishment procedure UPM 5GSM / UE requested PDU session modification procedure UPR 5GSM / UE requested PDU session release procedure SST 5GSM / Status procedure
<scope2>	=	group2	REQ Request REJ Reject ACC Accept RES Response ABN Abnormal Case
<nn>	=	sequential number	(01 to 99)

NOTE: This naming scheme results into a one-to-one correspondence between the test purpose identifiers as defined in ETSI TS 103 921-2 [3] and the test case identifiers.
The TP identifier of the test case TC_xxx_01 is TP_xxx_01.

Annex A (normative): 5G NAS N1 Partial PIXIT pro forma

A.1 The right to copy

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

The PIXIT Pro forma is based on ISO/IEC 9646-6. Any additional information which may be needed can be found in this international standard document.

A.2 Identification summary

Table A.1

PIXIT Number:	
Test Laboratory Name:	
Date of Issue:	
Issued to:	

A.3 ATS summary

Table A.2

Protocol Specification:	ETSI TS 124 501 version 16.14.0 (Release 16)
Protocol to be tested:	NGAP
ATS Specification:	ETSI TS 103 921-2
Abstract Test Method:	ETSI TS 103 921-3, clause 4

A.4 Test laboratory

Table A.3

Test Laboratory Identification:	
Test Laboratory Manager:	
Means of Testing:	
SAP Address:	

A.5 Client identification

Table A.4

Client Identification:	
Client Test manager:	
Test Facilities required:	

A.6 SUT

Table A.5

Name:	
Version:	
SCS Number:	
Machine configuration:	
Operating System Identification:	
IUT Identification:	
PICS Reference for IUT:	
Limitations of the SUT:	
Environmental Conditions:	

A.7 Protocol layer information

A.7.1 Protocol identification

Table A.6

Name:	ETSI TS 124 501: "5G; Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3"
Version:	Version 16.14.0 (Release 16)
PICS References:	ETSI TS 103 921-1

A.8 PIXIT items

A.8.1 Introduction

Tables in this clause need to be filled by the IUT Manufacturer to specify how the IUT needs to be configured with IUT specific values or describe IUT specific procedures required for complete testing of the IUT.

Each PIXIT item corresponds to a Module Parameter of the ATS.

A.8.2 Port and Address items

Table A.7: Test system ports and addresses

Item	Identifier	Type	Description
1	PX_NGAP_ETS_IPADDR	Charstring	IP address of the gNB/AMF test system
2	PX_NGAP_ETS_PORT	Integer	Port number of the gNB/AMF test system
3	PX_NGAP_ETS_IPADDR2	Charstring	IP address of the second gNB test system
4	PX_NGAP_ETS_PORT2	Integer	Port number of the second gNB test system
5	PX_VA	Integer	Variant selection
6	PX_VA_CRITICALITY	Enum	Criticality for variant selection
7	PX_TNGRELOCOOverall	Float	Timer TNGRELOCOOverall

Table A.8: SUT ports and addresses

Item	Identifier	Type	Description
1	PX_NGAP_SUT_IPADDR	Charstring	IP address of the gNB/AMF system under test
2	PX_NGAP_SUT_PORT	Integer	Port number of the gNB/AMF system under test

A.8.3 LibCommon items

Table A.9: PIXIT for LibCommon

Item	Identifier	Type	Description
1	PX_TSYNC_TIME_LIMIT	Float	Default time limit for a sync client to reach a synchronization point
2	PX_TSHUT_DOWN_TIME_LIMIT	Float	Default time limit for a sync client to finish its execution of the shutdown default

A.8.4 LibNGAP items

Table A.10: PIXIT for LibNGAP

Item	Identifier	Type	Description
1	PX_AMF_UE_NGAP_ID	integer	Unique identifier assigned by the AMF to the UE for NGAP signalling purposes
2	PX_RAN_UE_NGAP_ID	integer	This IE carries an identifier assigned by the RAN to the UE for the purposes of NGAP signalling
3	PX_PDU_SESSION_ID	integer	The identifier for the PDU session
4	PX_SST	integer	Single Network Slice Selection Assistance Information
5	PX_TRANSPORT_LAYER_ADDRESS	bitstring	Transport Layer Address
6	PX_SOURCE_TRANSPORT_LAYER_ADDRESS	bitstring	Source Transport Layer Address
7	PX_MC_TRANSPORT_LAYER_ADDRESS	bitstring	Multicast Transport Layer Address
8	PX_GTP_TEID	octetstring	GPRS Tunnelling Protocol - Tunnel Endpoint Identifier
9	PX_QOS_FLOW_IDENTIFIER	integer	To identify QoS flow
10	PX_ALTERNATIVE_QOS_PARAM_SET_INDEX	Integer	To Indicate alternative sets of QoS parameters for the QoS flow
11	PX_ALTERNATIVE_QOS_PARAM_SET_NOTIFY_INDEX	integer	To indicate the QoS parameters set which can currently be fulfilled
12	PX_PLMN_IDENTITY	octetstring	The Mobile Country Code (MCC) and Mobile Network Code (MNC)
13	PX_EUTRA_CELL_IDENTITY	bitstring	The leftmost bits of the E-UTRA Cell Identity IE correspond to the ng-eNB ID
14	PX_PDU_SESSION_RESOURCE_RELEASE_COMMAND_TRANSFER	octetstring	
15	PX_EXPECTED_ACTIVITY_PERIOD	integer	The expected activity time in seconds
16	PX_EXPECTED_IDLE_PERIOD	integer	The expected idle time in seconds
17	PX_RRC_STATE	enum	To indicate the RRC state of the UE
18	PX_AMF_POINTER	bitstring	To identify the AMF within the global 5G network
19	PX_AMF_REGION_ID	bitstring	To identify the AMF within the global 5G network
20	PX_AMF_SET_ID	bitstring	To identify the AMF within the global 5G network
21	PX_TAC	octetstring	To uniquely identify a Tracking Area Code
22	PX_RRC_ESTABLISHMENT_CAUSE	enum	To indicate the reason for RRC Connection Establishment/Resume

Item	Identifier	Type	Description
23	PX_RRC_RESUME_CAUSE	enum	To indicate the reason for RRC Connection Establishment/Resume
24	PX_HANDOVER_TYPE	enum	To indicate which kind of handover was triggered in the source side
25	PX_UE_AGGREGATE_MAXIMUM_BIT_RATE_DL	integer	To indicates the UE Aggregate Maximum Bit Rate as specified in ETSI TS 123 501 in the downlink direction (bit/s)
26	PX_UE_AGGREGATE_MAXIMUM_BIT_RATE_UL	integer	To indicates the UE Aggregate Maximum Bit Rate as specified in ETSI TS 123 501 in the uplink direction (bit/s)
27	PX_NR_ENCRYPTION_ALGORITHMS	Bitstring	Each position in the bitmap represents an encryption algorithm
28	PX_NR_INTEGRITY_PROTECTION_ALGORITHMS	bitstring	Each position in the bitmap represents an encryption algorithm
29	PX_DRB_ID	integer	Contains the DRB ID
30	PX_AMF_NAME	string	To uniquely identify the AMF
31	PX_RAN_NODE_NAME	string	Human readable name of the NG-RAN node
32	PX_MESSAGE_IDENTIFIER	bitsring	To identify the warning message
33	PX_SERIAL_NUMBER	bitsring	To identifies a particular message from the source and type
34	PX_REPETITION_PERIOD	integer	To indicate the periodicity of the warning message to be broadcast
35	PX_NUMBER_OF_BROADCASTS_REQUESTED	integer	To indicate the number of times a message is to be broadcast
36	PX_Index_to_RAT_Frequency_Selection_Priority	integer	To indicate local configuration for RRM strategies such as camp priorities in Idle mode and control of inter-RAT/inter-frequency handover in Active mode
37	PX_MaskedIMEISV	bitstring	To indicate IMEISV value with a mask, to identify a terminal model without identifying an individual Mobile Equipment.
38	PX_CAUSE_INITIAL_SETUP_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
39	PX_UE_CONTEXT_RELEASE_COMMAND_CAUSE	enum	To indicate the reason for a particular event for the NGAP protocol
40	PX_CAUSE_UE_CONTEXT_MODIFICATION_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
41	PX_CAUSE_UE_CONTEXT_SUSPEND_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
42	PX_CAUSE_UE_CONTEXT_RESUME_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
43	PX_CAUSE_HANDOVER_REQUIRED	enum	To indicate the reason for a particular event for the NGAP protocol
44	PX_CAUSE_HANDOVER_PREPARATION_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
45	PX_CAUSE_HANDOVER_REQUEST	enum	To indicate the reason for a particular event for the NGAP protocol
46	PX_CAUSE_HANDOVER_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
47	PX_CAUSE_HANDOVER_CANCEL	enum	To indicate the reason for a particular event for the NGAP protocol
48	PX_CAUSE_NAS_NON_DELIVERY_INDICATION	enum	To indicate the reason for a particular event for the NGAP protocol
49	PX_NG_SETUP_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
50	PX_RAN_CONFIGURATION_UPDATE_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
51	PX_AMF_CONFIGURATION_UPDATE_FAILURE	enum	To indicate the reason for a particular event for the NGAP protocol
52	PX_CAUSE_MULTIPLE_LOCATION_REPORTING	enum	To indicate the reason for a particular event for the NGAP protocol

A.8.5 Lib5GNAS items

Table A.11: PIXIT for Lib5GNAS

Item	Identifier	Type	Description
1	PX_PLMN	NAS_PlmnId	The Mobile Country Code (MCC) and Mobile Network Code (MNC)

Annex B (normative): NGAP N2 Abstract Test Suite (ATS)

B.1 The TTCN-3 Module

This ATS has been produced using the Testing and Test Control Notation (TTCN-3) according to ETSI ES 201 873-1 [6].

This test suite has been compiled error-free using TTCN-3 compiler.

The TTCN-3 library modules corresponding to the ATS are released in the ETSI forge repository:

<https://forge.etsi.org/rep/int/5g-core/nas/-/tree/main/ttcn>.

History

Document history		
V1.1.1	April 2025	Publication