

# ETSI TS 102 708-1-3 V1.1.1 (2010-03)

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*Technical Specification*

**Intelligent Transport Systems (ITS);  
RTTT;  
Test specifications for High Data Rate (HDR) data  
transmission equipment operating in the 5,8 GHz ISM band;  
Part 1: Data Link Layer;  
Sub-Part 3: Abstract Test Suite (ATS)  
and partial PIXIT proforma**

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**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
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## Foreword

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

The present document is part 1, sub-part 3 of a multi-part deliverable covering the test specifications for High Data Rate (HDR) Dedicated Short Range Communication (DSRC).

Full details of the entire series can be found in part 1-1 [2].

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# 1 Scope

The present document contains the Abstract Test Suite (ATS) and partial PIXIT proforma to test the "Dedicated Short Range Communication" (DSRC) "High Data Rate" (HDR) data link layer [1].

The objective of this abstract test specification is to provide test scripts for testing conformance of DSRC-HDR equipment specified in [1] giving a high probability of inter-operability between different manufacturer's equipment.

All formal test scripts provided in the present test specification are based on TS 102 708-1-2 [3].

The ISO standard for the methodology of conformance testing (ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5] and ISO/IEC 9646-5 [6]), ETS 300 406 [7] and ES 201 873-1 [8] specifying the TTCN-3 core language are used as a basis for the test methodology.

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# 2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
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## 2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI ES 200 674-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band".
- [2] ETSI TS 102 708-1-1: "Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 1: Data Link Layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [3] ETSI TS 102 708-1-2: "Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 1: Data Link Layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [4] ISO/IEC 9646-1 (1991): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
- [5] ISO/IEC 9646-2 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite Specification".

- [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] ETSI ETS 300 406: "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- [8] 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".
- [9] ETSI ES 201 873-5: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 5: TTCN-3 Runtime Interface (TRI)".
- [10] ETSI ES 201 873-6: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 6: TTCN-3 Control Interface (TCI)".

## 2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] ETSI TS 102 708-2-3: "Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 2: Application Layer Common Application Service Elements; Sub-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 ES 200 674-1 [1], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ES 201 873-1 [8] and the following apply:

**abstract test case:** Refer to ISO/IEC 9646-1 [4].

**Abstract Test Method (ATM):** Refer to ISO/IEC 9646-1 [4].

**Abstract Test Suite (ATS):** Refer to ISO/IEC 9646-1 [4].

**Implementation Under Test (IUT):** Refer to ISO/IEC 9646-1 [4].

**Lower Tester (LT):** Refer to ISO/IEC 9646-1 [4].

**Test Purpose (TP):** Refer to ISO/IEC 9646-1 [4].

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ES 200 674-1 [1], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ES 201 873-1 [8] and the following apply:

ATS	Abstract Test Suite
IUT	Implementation Under Test
OBU	On Board Unit
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PIXIT	Partial Protocol Implementation Extra Information for Testing
RSU	Road Side Unit
SUT	System under Test

TC	Test Case
TP	Test Purpose
TS	Test System
TSS	Test Suite Structure
TTCN	Testing and Test Control Notation
TTCN-3	Testing and Test Control Notation version 3

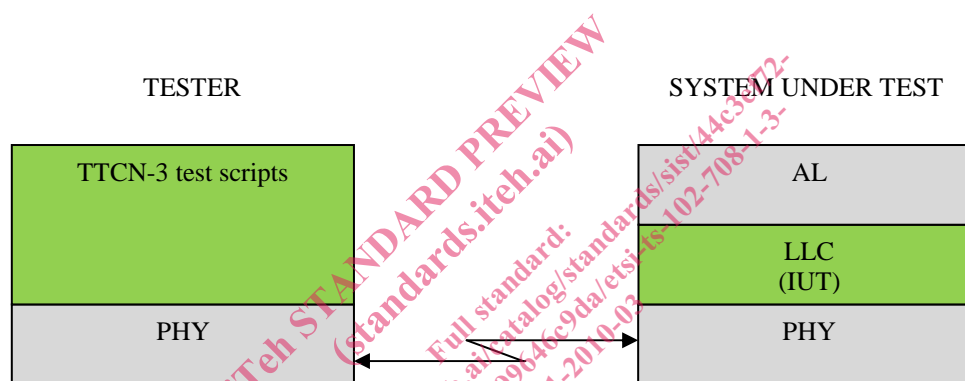
## 4 Abstract Test Method (ATM)

This clause describes the ATM used to test TS 102 708-1-2 [3].

### 4.1 Protocol layer architecture

The implementation under test is the LLC layer of ES 200 674-1 [1]. The System under test comprises also the PHY layer and the application layer, which are necessary to perform the IUT tests.

The tester executes the TTCN-3 scripts of the present Test Specification, running on an emulated PHY layer.



**Figure 1: Protocol layer architecture**

Table 1 shows the DLL Test Suite Structure (TSS) including its subgroups defined for the conformance testing.

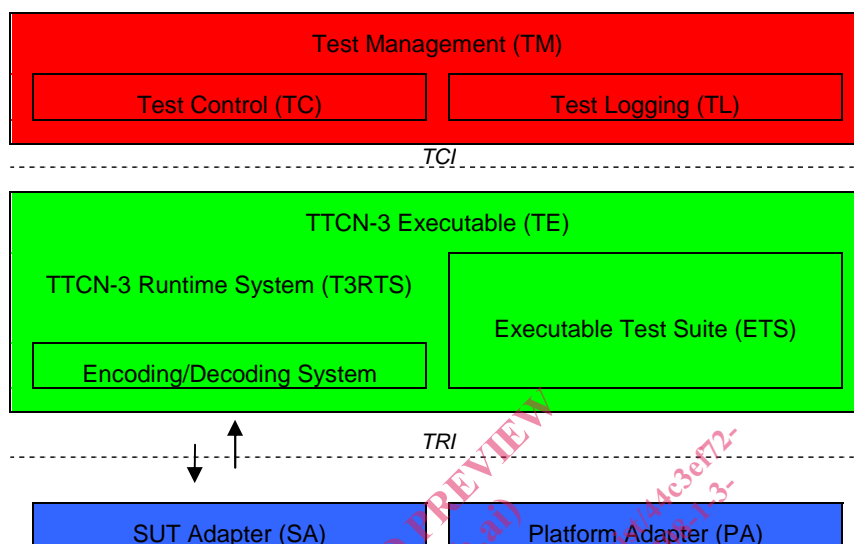
**Table 1: Test suite structure for DSRC-HDR data link layer**

Layer	Type of system under test (SUT)	Behaviour
DLL (Data link layer)	OBU (On Board Unit)	BV (Valid behaviour)
		BI (Invalid behaviour)
	RSU (Road Side Unit)	BV (Valid behaviour)
		BI (Invalid behaviour)

## 4.2 Test system architecture

### 4.2.1 The TTCN-3 test architecture

An abstract architecture for a test system (TS) implementing a TTCN-3 ATS is displayed in figure 2 and also stated in ES 201 873-5 [9].



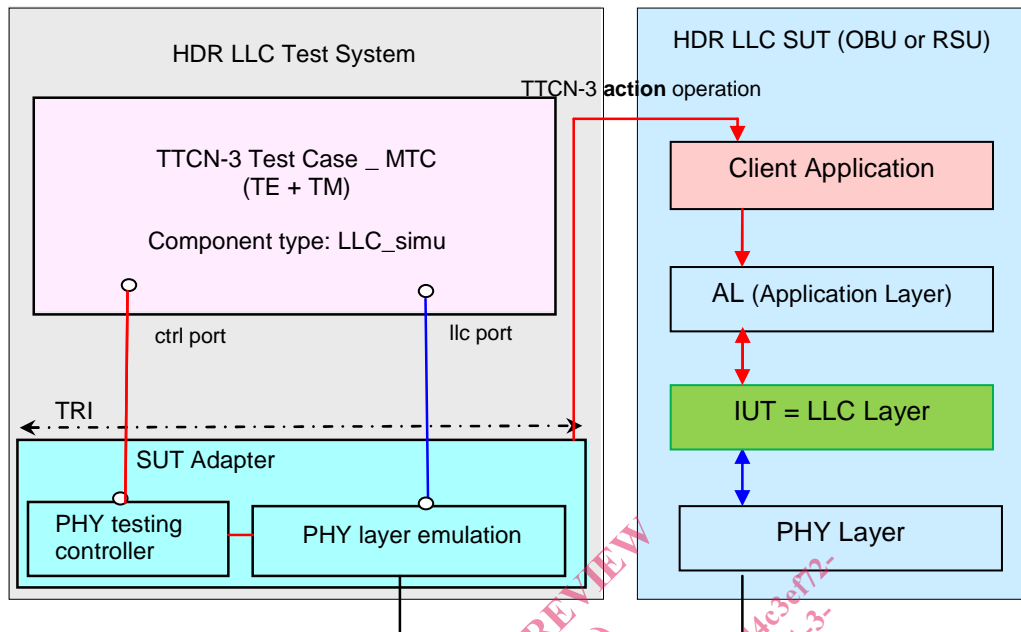
**Figure 2: The TTCN-3 Abstract Test System Architecture**

A TS has two interfaces, the TTCN-3 Control Interface (TCI) and the TTCN-3 Runtime Interface (TRI), which specify the interface between Test Management (TM) and TTCN-3 Executable (TE) entities, and TE, SUT Adapter (SA) and Platform Adapter (PA) entities, respectively. Out of these two interfaces the TRI has been standardized in ES 201 873-5 [9], whereas the specification and implementation of the TCI is in ES 201 873-6 [10].

The part of TS that deals with interpretation and execution of TTCN-3 modules, i.e. the Executable Test Suite (ETS), is shown as part of the TTCN-3 Executable (TE). This ETS corresponds either to the executable code produced by a TTCN-3 compiler or a TTCN-3 interpreter from the TTCN-3 ATS in a TS implementation. The remaining part of the TS, which deals with any aspects that cannot be concluded from information being present in the TTCN-3 ATS alone, can be decomposed into Test Management (TM), SUT Adapter (SA) and Platform Adapter (PA) entities. In general, these entities cover a TS user interface, test execution control, test event logging, communication of test data with the SUT and timer implementation.



## 4.2.2 The HDR LLC test architecture



**Figure 3: The HDR LLC Test System Architecture**

The HDR LLC Test System Architecture, as described in figure 3, shows the interaction between the test case execution (TE) and the test adapter, as required to cover the test purpose requirements.

LLC frames, sent to the SUT and received from the SUT are handled by the SA in order to fit the TTCN-3 types (see port mapping in the clause 4.2.3).

In particular, it is not smart to manage the values of some fields of the frames, which require dynamic bitwise computation, like for instance the frame flags and the Frame Check Sequence fields. As consequence, the llc port does only manage frames without flags and FCS.

Flags and FCS shall be autonomously and correctly managed by the "PHY layer emulation".

As some test purposes require to generate specific or invalid values of flag and FCS, the ctrl port is used to control these actions from the TTCN-3 test cases. Furthermore, certain timing values can not be measured using the TTCN-3 test commands, like for instance closing flag to closing flag timing. Thus this value shall be measured by the SUT adapter and transmitted to the TTCN-3 over the ctrl port. see port mapping in the clause 4.2.3.

RSU test cases requires to trigger some actions in the IUT, which result in sending the expected frames to the tester. Triggering these action is realized in TTCN-3 by using the **action** operation (see in ES 201 873-1 [8]). According to the TTCN-3 standards, the **action** operation can result in different types of behaviour. For the best automatization of the test system, it is recommend to use the **action** operation to trigger the IUT for sending the required frames. At a minimum, the TTCN-3 test system shall generate text windows to invite the test operator to activate the necessary procedures in the IUT for sending the required frames.

## 4.2.3 Port mapping

### 4.2.3.1 Mapping rules for the llc port

Two TTCN-3 types are sent and received over the llc port:

- the Lpdu type;
- the LpduExceedN2 type.