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Road Administration*

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Test Specification for Interoperable EFC-DSRC Systems in Sweden

Evaluation of Conformity to the Basic Requirements

Titel: Test Specification for Interoperable EFC-DSRC Systems in Sweden – Evaluation of Conformity of the Basic Requirements.

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Förord

ATB EFC är en allmän teknisk beskrivning (ATB) som innehåller Vägverkets krav på upphandling och utformning av elektroniska system för bilavgifter¹. Syftet är att garantera teknisk interoperabilitet mellan bilavgiftssystem i Sverige.

ATB EFC omfattar de grundläggande kraven på fordonsenheter (OBU) och vägsidesutrustning (RSE) och kommunikation dem emellan (EFC transaktionen) i dokumentet; "Basic Requirements Specification for Interoperable EFC-DSRC Systems in Sweden" (Vägverkets Publikation 2003:155). I tillägg till detta publicerar Vägverket också en Teknisk Specifikation för test och prövning av fordonsenheter (OBU) och vägsidesutrustning (RSE) gentemot dessa krav (detta dokument). Då upphandlingar av EFC-system oftast genomförs på engelska är både ATB EFC och detta dokument författade på engelska.

ATB EFC skall användas vid upphandlingar i Sverige (där Vägverket medverkar) av bilavgiftssystem för uppbörd av trängselavgift eller för betalning av vägtull, vilka påbörjas fr.o.m. den 2003-12-01. ATB EFC avser i nuläget inte eventuella uppbördssystem för skatt på tunga fordon på det allmänna vägnätet, i de fall de baseras på annan teknik än DSRC.

Observera att inga kommersiella rättigheter (t.ex. att leverera EFC-produkter eller -system) garanteras om man framgångsrikt har genomfört tester i enlighet med denna specifikation.

Denna tekniska specifikation kan vid behov revideras, men skall i sådana fall i möjligaste mån beakta att tidigare upphandlade EFC-system, enligt ATB EFC, är kompatibla med senare versioner.

I inledningen av dokumentet förklaras mer ingående dess avgränsning och i vilket sammanhang denna tekniska specifikation tillämpas.

Borlänge i augusti 2004

Per Wenner

¹ Förkortas här med det engelska 'EFC'. Se kapitel 3 för förklaring av förkortningar och termer.

To the user of this specification

The Swedish Road Administration's (SRA's) specifications for interoperable electronic fee collection (EFC) in Sweden consist of two parts. The "Basic Requirements Specification" (SRA's publication 2003:155, [SwePaC]) defines the basic and critical elements for technical interoperability for electronic fee collection (EFC) systems based on dedicated short-range communication (DSRC) in Sweden. This "Test Specification" defines the tests to be performed for evaluation of OBU and RSE conformity to the basic requirements, as defined in SwePaC.

These specifications do neither provide a complete set of system's requirements nor a full set of requirements for all aspects of interoperability, but focus on necessary requirements for technical interoperability. See [SwePaC, chapter 1] for a more comprehensive definition of the context for the use of this specification.

As the use of EFC-DSRC is considered well known among EFC professionals; motivation, examples or user guidance are not included in the specification. For full understanding of the specification, a certain level of background knowledge in EFC and DSRC is required.

This specification is made publicly available by SRA with the aim to establish the technical framework for interoperability between EFC systems in Sweden, and to foster interoperability with EFC systems outside Sweden.

The specification shall always be referred to whenever used, and may be issued in later versions. Hence, the version number shall always be referred to whenever used.

"Test Specification for Interoperable EFC-DSRC Systems in Sweden – Evaluation of Conformity of the Basic Requirements" is the property of the Swedish Road Administration (SRA). It is a Technical Specification and is to be used together with the Basic requirements specification (in the ATB-series) regulating procurement and design of EFC-systems in Sweden.

No commercial rights, e.g. to deliver OBUs or RSEs, can be derived from a successfully qualification of the OBU or the RSE according to the tests defined in this document.

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1 Overview

1.1 Purpose

A set of two specifications is made publicly available by SRA with the aim to establish the technical framework for interoperability between EFC systems in Sweden (based on PISTA and CARDME), and to foster interoperability with EFC systems outside Sweden;

- “Basic Requirements Specification” (SRA’s publication 2003:155, [SwePaC]) defines the basic and critical elements for technical interoperability for electronic fee collection (EFC) systems based on dedicated short-range communication (DSRC) in Sweden.
- “Test Specification for Interoperable EFC-DSRC Systems in Sweden – Evaluation of Conformity of the Basic Requirements” (this document) defines the tests to be performed for evaluation of OBU and RSE conformity to the basic requirements, as defined in [SwePaC].

This test specification is designed as a support document for conformity evaluation as outlined later in the specification. This includes:

- Description of the approach towards conformity evaluation, including the roles, responsibilities and the timeliness of associated activities.
- Support for carrying out conformity evaluation in terms of test cases, requirements for documentation, etc. The test cases define “what” and “how” to conduct conformity evaluation, with reference to standard methods whenever applicable.
- Test cases are defined for OBU and RSE, respectively. Other parts of an EFC system are not covered.

[SwePaC] forms part of the ATB-series - general technical specifications issued by SRA – regulating procurement and design of EFC-systems in Sweden. This Test Specification is a supporting document to this ATB EFC. For a more detailed description of the purpose and context, please refer to [SwePaC, Chapter 1].

1.2 Background and context

In 2002 the need for an interoperable EFC solution in Sweden resurfaced with the increased interest in implementation of DSRC based EFC systems. Several projects are, at the time of writing of this document, in progress that may use this specification:

- **Öresund Bridge** (operates the BroBizz EFC system in co-operation with Store Bælt Bridge). Öresund Bridge is updating its EFC system for European interoperability based on the PISTA-specification.
- **Svinesund Bridge** will start operations of a fee collection system by 2005 (in co-operation with Norway). The EFC-system at Svinesund Bridge will be based on the PISTA-specification, and will in addition be able to handle also Norwegian AutoPass-clients.
- **Stockholm congestion charging** scheme aims to start operations in 2005 for the Stockholm inner city region.

There are also discussions on the introduction of motorway fees on the E6-link in western Sweden as well as heavy goods vehicle (HGV)-fee on the road network in Sweden.

During the last 10-15 years several projects and initiatives in Europe have worked with EFC interoperability. The results of these projects constitute a platform for this specification:

- **EU directive** on EFC. This defines the basic context for a European-wide EFC service.
- **MÅNS**. Nordic project that defines a MoU and a framework for (Nordic) interoperable EFC.

- **CESARE / PISTA.** ASECAP-led projects that define a solution for interoperable EFC between ASECAP-operators.
- **CARDME.** EC-project defining an EFC transaction and a common EFC service.
- **ETSI/CEN/ISO.** European and International standardisation bodies developing relevant standards.

The context for use of the specification is illustrated in figure 1.1 below.

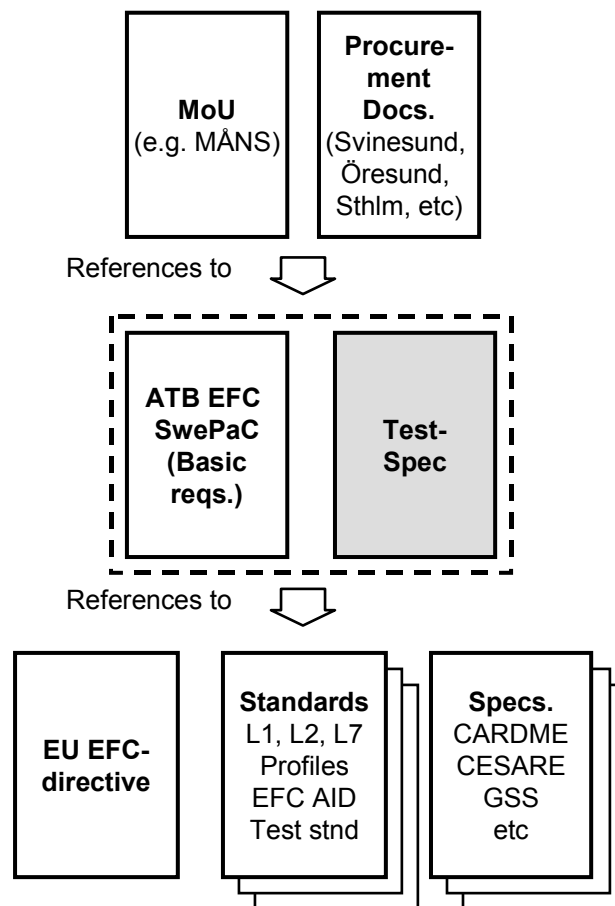


Figure 1.1 The context for the use of this specification.

Generally this specification refers to other specifications, whenever applicable, rather than copy or rewrite similar solutions. This ensures a flexible approach to upgrades, effective use of achieved consensus results, and a concise specification.

The specification can be used as a reference document and as a basic specification in two main situations:

- When specifying and procuring a local EFC system in Sweden (or elsewhere), this specification defines the tests to be performed for evaluation of OBU and RSE conformity to the basic requirements, as defined in SwePaC
- When making a MoU for interoperability (such as MÅNS for the Nordic countries), this specification may be used for conformity evaluation of the interoperable technical parts.

1.3 Main features

The main features of the requirements and test specifications are:

- Compliant with the EU-directive on EFC [EFC Directive].
- Complaint with the Radio Equipment and Telecommunications Terminal Equipment Directive [R&TTE] and the associated relevant harmonised standards, related to the essential requirements for radio parameters for the OBU [ETSI OBU] and RSE [ETSI RSE], respectively.
- Compliant with CEN / ISO standards. Implementation of DSRC set B.
- Central account based on CESARE / PISTA and CARDME EFC transactions. Thus, this specification includes the PISTA-solution chosen for interoperability between Öresund, Stora Bælt and Svinesund bridges.
- Full CARDME security scheme enabled.
- Interoperability between systems for motorway-fees and urban congestion charging.
- In line with EFC systems implemented in Sweden, Denmark, Austria, France and Spain that deploy mature industrial products from several suppliers.
- Manufacturer independent – all major vendors of OBU and RSE compliant with European DSRC 5.8 GHz can supply equipment according to this specification.
- Additional local solutions and transactions possible.
- Flexible classification scheme allowing for different solutions for users and operators.
- Clearly defined migration steps enabling operators (within a MoU) to implement defined additional security features.

1.4 Scope

The requirements and test specifications deal only with parts of a full system design (or a full MoU) for interoperability. The scope of the specifications is mainly defined by the physical architecture as the specifications focus on the OBU, roadside equipment (RSE) and the interface between OBU / RSE. The requirements are different on OBU and RSE in many cases.

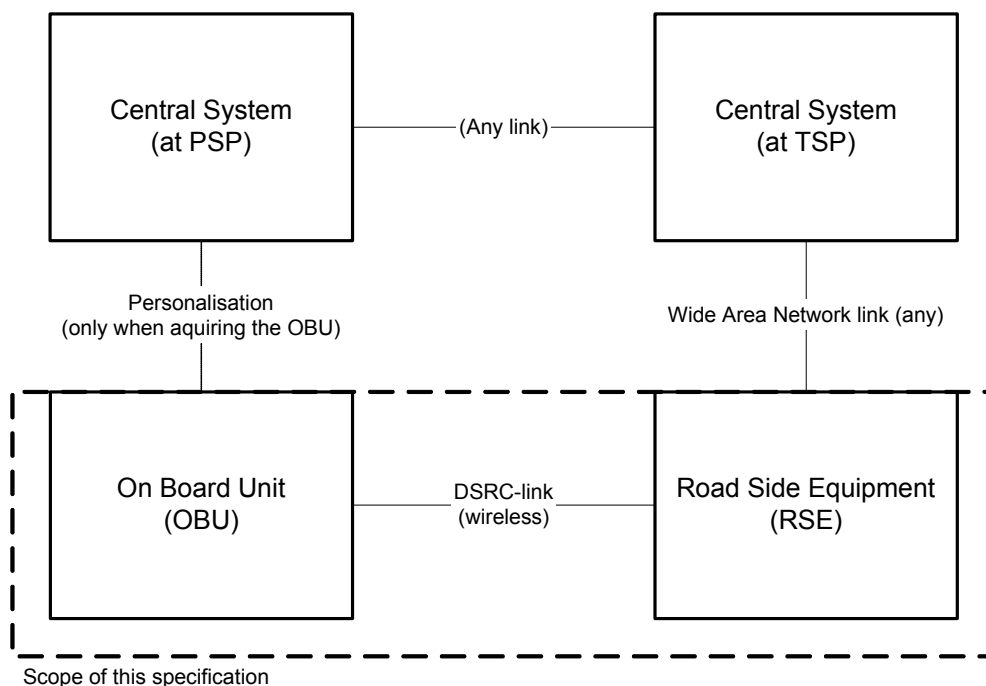


Figure 1.2 Illustration of the scope of this specification.

Summary of scope (the parts that are within the specifications):

- Payment method: Central account based on EFC-DSRC.
- The specification is primarily for use in Sweden, but with a clear aim to enable interoperability with other EFC systems in Europe.
- Physical systems: OBU, RSE and the interface between them.
- All functions and information flows related to the physical parts as above.
- All actors and responsibilities related to the physical parts as above.
- DSRC-link (for the interface as above).
- EFC transaction (for the interface as above).
- Data elements to be used by OBU and RSE.
- Security mechanisms for OBU and RSE.
- Conformance procedures and test specification.

The following aspects of EFC do not form part of the specifications (but may benefit from the specification):

- Full requirements for procurement of an entire system.
- Contractual interoperability requirements (including MoU issues).
- Procedural interoperability requirements and organisation.
- Setting-up of central organisation (clearing operator, trusted third party (TTP)) etc.
- Legal issues.
- Other payment methods.
- Other basic technologies (e.g. global navigation and satellite system / cellular network or video registration).
- Other interfaces or functions in EFC than those specified above.
- Handling of and migration from local existing EFC systems (e.g. the current BroBizz).

The scope of this test specification is the same as the requirements specification [SwePaC], i.e. focusing on the critical interoperability elements from a technical interoperability perspective.

The OBU and the RSE are subject to additional testing in order to ascertain that they fulfil the essential requirements as set out in European Directives – a pre-requisite for CE marking² and placing on the European market. They are also likely to be subject to additional testing of physical, environmental endurance, quality assurance and control at manufacturing, charge point integration and performance aspects, as part of factory, site and system acceptance testing. The definition of these tests is outside the scope of this document.

² The CE mark - the mandatory European marking for certain product groups such as DSRC - indicates conformity to the essential (health, safety, effective use of spectrum etc) requirements as set out in European ("R&TTE", "ElectroMagnetic Compatibility" and "Low Voltage") Directives.

1.5 Structure and contents of the document

This test specification is deliberately written to be concise. Motivation, tutorial examples or user guidance are not included in the specification. For full understanding of this specification, a certain level of background knowledge in EFC and DSRC and conformity evaluation is required.

Structure and contents (Chapters 4-7 constitute the main body of the specification):

Chapter 1	Overview and context of this document
Chapter 2	References used in this specification
Chapter 3	Abbreviations used in this specification
Chapter 4	Philosophy and approach. Context and use of this specification, including roles, responsibilities, activities and their timeliness.
Chapter 5	Test case methodology. Defines the method used for definition of the tests to be performed for evaluation of the conformity of the EFC-DSRC equipment.
Chapter 6	OBU conformance evaluation. Defines the OBU tests to be performed for evaluation of the conformity of the OBU to the basic requirements as defined in [SwePaC].
Chapter 7	RSE conformance evaluation. Defines the RSE tests to be performed for evaluation of the conformity of the RSE to the basic requirements as defined in [SwePaC].
Annexes	Annex A: Notification for evaluation of conformity Annex B: Requirements on an Independent Reviewer Annex C: Conformity report check list Annex D: DSRC layer 2 performance test cases, as such tests are not yet covered by any standard or publicly available specification.

2 References

This specification incorporates by dated or undated reference, provisions from other publications.

These references are cited, including the relevant chapter(s) when applicable, 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 specification only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

Reference	Document no	Date	Document title
[SwePaC]	ISSN 1401-9612	2003-11	Basic Requirements Specification for Interoperable EFC-DSRC Systems in Sweden – A Specification for Implementation of PISTA and CARDME (SRA, v. 1.0, Publication 2003:155). Also referred to as ATB EFC in an SRA context.
[EN L1]	EN 12253	2004	Road Transport and Traffic Telematics (RTTT) – Dedicated Short-Range Communication (DSRC) – Physical layer using microwave at 5.8 GHz
[EN L2]	EN 12795	2002	Road Transport and Traffic Telematics (RTTT) – Dedicated Short-Range Communication (DSRC) – Medium access and logical link control
[EN L7]	EN 12834	2002	Road Transport and Traffic Telematics (RTTT) – Dedicated Short-Range Communication (DSRC) – Application Layer
[EN Profiles]	EN 13372	2004	Road Transport and Traffic Telematics (RTTT) – Dedicated Short-Range Communication (DSRC) – DSRC profiles for RTTT applications
[EFC AID]	EN ISO 14906	2004	Road Traffic and Transport Telematics (RTTT) – Electronic Fee Collection – Application interface definition for dedicated short range communication
[EFC AID TESTS]	CEN ISO/DTS 14907-2		Road Traffic and Transport Telematics (RTTT) – Electronic Fee Collection – OBU conformance test procedures
[MOP TESTS]		2002	Conformance tests to the specification for interoperability in the beacon – transponder transaction (Public Works, Transport and Telecommunications Ministry, Chile, Version 1.0, 2002-01-22, CEN/TC278/WG1 N677)
[ETSI DSRC]	prEN 300 674-1		Electromagnetic compatibility and Radio spectrum Matters (ERM) - Road Transport and Traffic Telematics (RTTT) - Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band - Part 1: General characteristics and test methods for RSU and OBU
[ETSI RSE]	prEN 300 674-2-1		Electromagnetic compatibility and Radio spectrum Matters (ERM) - Road Transport and Traffic Telematics (RTTT) - Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band - Part 2-1: Harmonised EN for the RSU under article 3.2 of the R&TTE Directive.

Reference	Document no	Date	Document title
[ETSI OBU]	prEN 300 674-2-2		Electromagnetic compatibility and Radio spectrum Matters (ERM) - Road Transport and Traffic Telematics (RTTT) - Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band - Part 2-2: Harmonised EN for the OBU under article 3.2 of the R&TTE Directive
[ISO/IEC 17025]	ISO/IEC 17025		General requirements for competence of testing and calibration laboratories
[R&TTE]	Directive 1999/5/EC	1999-03-09	Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity
[EFC Directive]	Directive 2004/52/EC	2004-04-29	Directive 2004/52/EC of the European Parliament and the Council on the Interoperability of Electronic Road Toll Systems in the Community
[MÅNS]		2001-03-01	MÅNS Project – Final reports (2003-03-01) <ul style="list-style-type: none"> • Guidelines on manual payment (1.1, v. 1.75) • Guidelines on automatic payment using central accounts (2.1, v. 1.31) • Guidelines on classification (3.1, v. 1.9) • Guidelines on user information (4.1, v. 1.4) • Guidelines on exception handling (5.1, v. 5.1) • Guidelines on clearing of EFC transactions (6.1, v. 1.4) • Proposal on contractual interoperability (MoU) between Denmark, Finland, Norway and Sweden (7.1, v. 1.5) • The MÅNS terminology (8.1, v. 1.4) • The MÅNS approach (8.2, v. 1.3) • The MÅNS policy (8.3, v 1.1)
[CARDME]	IST-1999-29053 Deliverable 4.1	2002	CARDME-4 – The CARDME concept (Final, 1 June 2002)
[CESARE]	D.032.1	2002-02-27	CESARE II Project. Detailed CESARE Technical Specification.
[PISTA]	IST-2000-28597 D3.4	2002-11-11	PISTA – Transaction Model
[GSS]		2003	Global Specification for Short Range Communication (Kapsch TrafficCom AB, Kapsch Telecom GmbH, Thales e-Transactions CGA SA, version 3.2, 2003-08, http://www.etc-interop.com/pdf/gss_32.pdf)
[ISO 9001]	ISO 9001		Quality management systems -- Requirements
[92/50/EEC]	Council Directive 92/50/EEC	1992-06-18	Council Directive 92/50/EEC of 18 June 1992 relating to the coordination of procedures for the award of public service contracts.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purpose of this specification, the following terms and definitions apply. The source of the terms and definitions are highlighted in brackets whenever applicable.

Implementation conformance statement (ICS) [EFC AID TESTS, clause 3.12]

A statement made by the supplier of an implementation or system claimed to conform to a given specification, stating which capabilities have been implemented.

Implementation conformance statement proforma (ICS proforma) [EFC AID TESTS, clause 3.13]

A document, in the form of a questionnaire, which when completed for an implementation or system becomes an implementation conformance statement.

Implementation extra information for testing (IXIT) [EFC AID TESTS, clause 3.14]

A statement made by the supplier or an implementor of an implementation under test (IUT) which contains or references all of the information (in addition to that given in the implementation conformance statement) related to the IUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the IUT.

Implementation extra information for testing proforma (IXIT proforma) [EFC AID TESTS, clause 3.15]

A document, in the form of a questionnaire, which when completed for an IUT becomes an implementation extra information for testing.

Tester [based on 3.25 in OBU AID tests]

A combination of equipment and processes which is able to perform conformance tests according to this specification.

3.2 Abbreviations

For the purpose of this specification, the following abbreviations apply throughout the document unless otherwise specified:

AID	Application Interface Definition
ASECAP	European Association of Companies with Concessions for Motorway, Bridge and Tunnel Tolls (Association européenne des Concessionnaires d'Autoroutes et des Ouvrages à Péage, www.asecap.com)
ATB	General Technical Specification (Allmän Teknisk Beskrivning)
BST	Beacon Service Table
CARDME	Concerted Action for Research on Demand Management in Europe
CEN	European Committee for Standardization (Comité Européen de Normalisation, www.cenorm.be)
CESARE	Common EFC System for ASECAP Road Tolling European System
DSRC	Dedicated Short-Range Communication
EC	European Commission
EFC	Electronic Fee Collection
EN	European Standard
ETSI	European Telecommunications Standards Institute (www.etsi.org)
GSS	Global Specification for Short Range Communication
HGV	Heavy Goods Vehicle
ICS	Implementation Conformance Statement
IR	Independent Reviewer
ISO	International Organization for Standardization (www.iso.ch)
IUT	Implementation Under Test
IXIT	Implementation eXtra Information for Testing
L1	Layer 1 of DSRC (Physical Layer)
L2	Layer 2 of DSRC (Data Link Layer)
L7	Layer 7 of DSRC (Application Layer)
MAC	Medium Access Control
MMI	Man-Machine Interface
MOPTT	Public Works, Transport and Telecommunications Ministry – Republic of Chile
MoU	Memorandum of Understanding
MÅNS	Achieving Interoperability between the Nordic Payment Payment Means for Road User Charges
N/A	Not Applicable
OBU	On-Board Unit
PISTA	Pilot on Interoperable Systems for Tolling Applications
PSP	Payment Service Provider
PW	Password
RSE	Roadside Equipment
SRA	Swedish Road Administration (www.vv.se)
T-APDU	Transfer-Application Protocol Data Unit
TSP	Transport Service Provider
TTP	Trusted Third Party
VST	Vehicle Service Table

4 Conformity evaluation approach and process

4.1 Use of the specifications

An OBU or RSE to be used in Swedish EFC-systems will most likely (in the next years) be procured by an operator. This also means that the operator in most cases will be the organisation that provides the Swedish EFC specification to EFC Suppliers (as a part of the procurement process). The “normal” role of SRA, in this context, would be to act in the background providing the basic interoperability specifications. Note that these must be complemented with the operator’s other requirements on the EFC-system. This basic context for use of the specifications is illustrated in Figure 4.1 below.

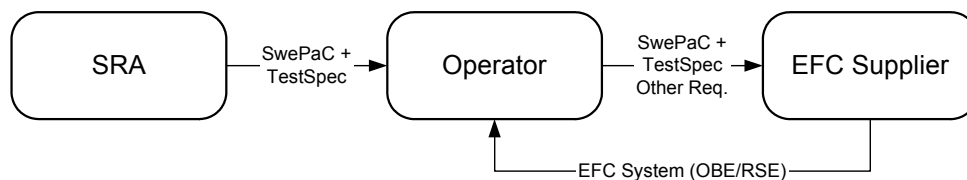


Figure 4.1 Context for use of the specifications

Whenever an EFC-supplier wishes to supply EFC-equipment for use in Sweden the EFC-equipment should be conformant to [SwePaC] in order to ensure technical interoperability between EFC-systems in Sweden. Thus, EFC-suppliers have to prove conformance to the basic requirements specification by performing a conformance evaluation as outlined in this test specification.

The EFC-supplier may go directly to SRA with a request to evaluate conformance of EFC equipment to the basic requirements [SwePaC], or may do this together with an operator. This may be done as a part of a procurement process or independently of such a process. For simplicity the process below outlines a situation where the EFC-supplier performs conformity evaluation without the active participation of an operator.

4.2 Approach

The basic principle and approach for conformity evaluation is that it is the responsibility of the EFC-supplier to provide the necessary proof (in form of testing, test analysis, test reports and statements) of conformity to the requirements specification [SwePaC]. This means that the conformity evaluation is conducted by the EFC-supplier, and that the process is largely based on self-testing. This approach enables a cost-effective and flexible conformity evaluation where the technical parts can be handled by organisations that have comprehensive technical knowledge and experiences in DSRC, EFC and testing. Conformity relies on an affirmation from the EFC-supplier of conformance, with an additional appraisal by an independent reviewer (IR).

Note that the process is not the same as the certification procedures usually conducted for IT-applications³. This is due to the relative early status of interoperable EFC and the importance of an

³ These focus on health and safety aspects, and in case of wireless technology also effective use of the spectrum.

interoperable service and equipment. Whenever interoperable EFC is more mature and is in operation over Europe⁴ these conformity procedures may also be formalised similarly to common certification procedures. The approach includes the use of an Independent Reviewer for a competent impartial review of the tests performed. The use of an independent reviewer is similar to common certification procedures for technologies where no harmonised European standards exist, or for effective evaluation of a product portfolio based on harmonised European standards.

4.3 Roles

The actors and roles involved in the conformity evaluation are:

- **SRA** (being the owner of the specifications). Provides specifications⁵, explanations and precisions in case of ambiguities related to the specifications. SRA expresses its opinion whether it deems the organisation proposed by the EFC-supplier fit to fulfil the Independent Reviewer role. SRA expresses its opinion regarding the interpretation of the specifications should a need arise.
- **EFC-supplier**. Runs the evaluation process, performs tests, and writes test report.
- **Independent Reviewer (IR)**. Is used for a competent and independent review of the tests performed by the EFC-Supplier, issues Conformity Appraisal Statement upon review of the EFC-supplier's test report. Requirements for Independent Reviewers are listed in Annex B.
- **Operator** (optional). May take part in tests or support the EFC-supplier with test facilities etc in cases of procurement.
- **Test House** (optional). The EFC-supplier may (or may not) use an independent test house for carrying out certain tests.

Notes on roles:

The role of SRA is merely that of being specification owner⁶. SRA will undertake to:

- Provide the basic requirements specification [SwePaC].
- Provide the test specification (this document), including support for carrying out conformity evaluation in terms of test cases, requirements for documentation, etc. The test cases define “what” and “how” to conduct conformity evaluation, with reference to standard methods whenever applicable.
- Provides Information about all systems and products that are declared conformant (and a reference list of documents).
- Provides Information about organizations and experts that have accomplished, according to SRA, the Independent Reviewer role.
- Take measures for handling any ambiguity related to the use of the specifications, including statement of opinion on the interpretation of the specifications or conformity of equipment should a need arise.

Independent Reviewers fulfil a quality assurance role through their review of the tests performed by the EFC-suppliers. The conformant applicant (e.g. the EFC-supplier) is to pay the Independent Reviewer (IR) for its role in conformity evaluation, SRA will not pay the IR.

⁴ The EC is setting up, at the time of writing of this document, a regulatory committee that will determine the detailed arrangements for a European electronic toll service, which may include specifications for DSRC-EFC and related harmonised standards and test specifications.

⁵ These may be freely downloaded from SRA's website (www.vv.se) or may be ordered as a paper copy against a small administrative handling fee.

⁶ This role may be transferred to an MoU-organisation in case such take over the ownership of the specifications.

4.4 Conformity evaluation process

The conformity evaluation process is outlined in figure 4.2 below. Each step in the process is explained after the figure.

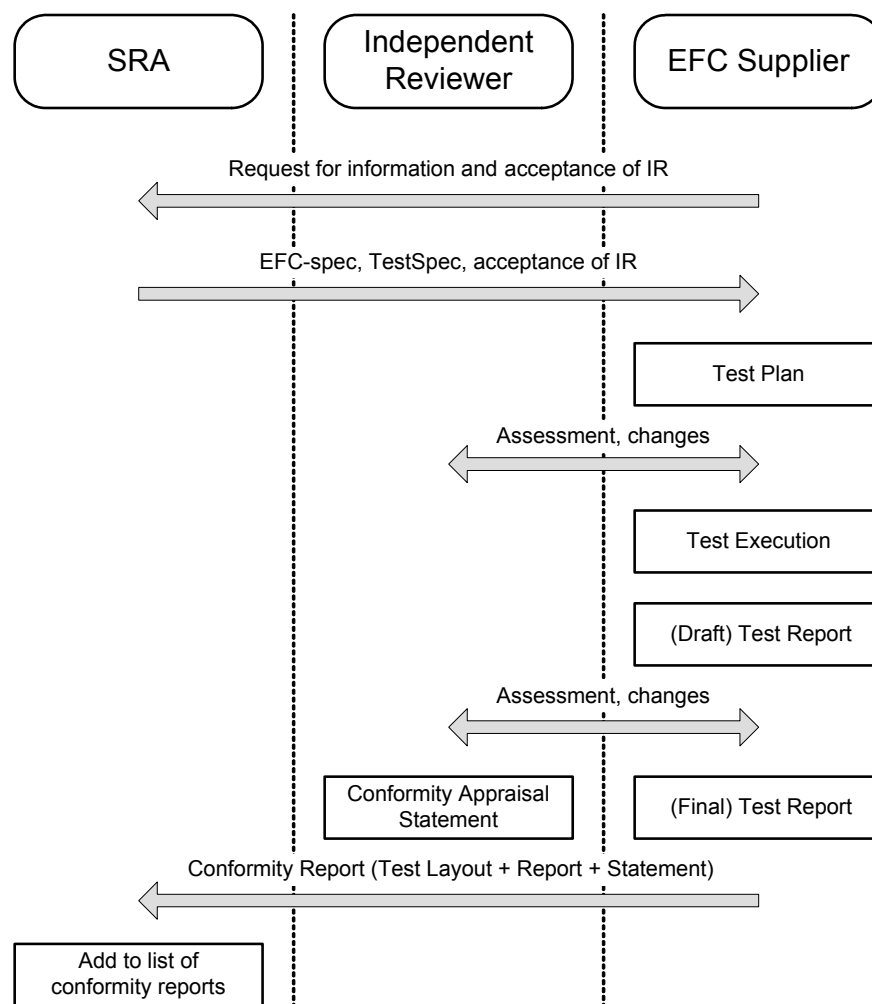


Figure 4.2 Responsibilities and timeliness of conformity evaluation activities.

Notification of conformity evaluation

The EFC supplier ensures himself, as part of his preparation of the conformity evaluation, that he is in possession of the latest version of the basic requirements specification [SwePaC] and the “Test Specification” (this document), by contacting SRA⁷ or via its website⁸.

As part of the preparation, the EFC-supplier also selects an Independent Reviewer (IR) and informs his choice by submitting a ‘**Notification of conformity evaluation**’ (i.e. see Annex A).

⁷ See “To the User of this specification” for contact person and details.

⁸ http://www.vv.se/publ_blank/bokhylla/intro/bok.htm, at the time of writing of this test specification.

Response to notification of conformity evaluation

SRA will provide a response to the EFC supplier's notification for the purpose of providing its opinion on whether the reviewer suggested by the EFC supplier is deemed fit by SRA to fulfil the Independent Reviewer (IR) role, as defined in Annex B. .

Conformity evaluation planning

The EFC supplier is responsible for planning the conformity evaluation. The output⁹ of the EFC supplier's planning of the conformity evaluation shall include:

- a **Test Plan** that accounts for
 - a) identification of the product to be evaluated
 - b) how conformity is to be assessed highlighting similarities and differences, with motivation, with the test cases defined in 6 and 7 in this Test Specification for the OBU and RSE, respectively
 - c) intention to use relevant existing test results for similar or the same product with motivation.
 - d) who (i.e. organization) is intended to perform the testing / evaluation and analysis
 - e) intended test facilities, tools and test scriptsIt is recommended to account for when the tests and analysis are planned to be executed in the Test Plan, in order to enable test witnessing by the IR.
- an **Implementation Conformance Statement** (ICS), describing the capabilities, of the product to be evaluated by completion of the ICS proforma in Annex A in [EFC AID TESTS]
- an **Implementation eXtra Information for Testing** (IXIT) by completion of the IXIT proforma in Annex B in [EFC AID TESTS]. This provides information relating to the product and its testing environment that enables a tester¹⁰ to run an appropriate test suite against the implementation under test.

The EFC supplier should consult the Independent Reviewer (IR) in the preparation of the output of the planning (i.e. the Test Plan, ICS and IXIT) in order to ensure that the opinion of the IR, on whether the test plan allows to adequately appraise conformity of the implementation under evaluation, is reflected in the conformity evaluation plan¹¹.

Test execution, analysis and test reporting

The EFC supplier is responsible for execution of the tests, analysis and reporting of the results. Test witnessing by the IR is encouraged.

The test results shall be documented in a **test report**, including:

- identification of IUT
- test equipment
- test set-out
- test case
- identification of test log record
- overall test verdict

A (draft) test report shall be submitted by the EFC supplier to the IR for review. The comments of the IR may lead to clarifications and complementary testing by the EFC supplier. The IR shall provide a Conformity Appraisal Statement based on the final test report.

⁹ Albeit that the ICS and PIXIT proforma in [EFC AID tests] were formally prepared for OBU, they are also applicable and to be used for RSE.

¹⁰ This also ensures the possibility to perform testing by a third laboratory in case of dispute.

¹¹ In case the IR needs access to commercially sensitive information from the EFC-supplier, this may be regulated by non-disclosure agreements between the IR and EFC-supplier. Documents containing such information need to be referenced but not attached to the final public conformity report, but should on request be made available to the SRA.

The EFC supplier shall prepare the **Conformity Report**, containing:

- Conformity Statement by the Supplier
- Conformity Appraisal Statement (issued by the IR)
- The final Test Report
- The final Test plan
- The ICS
- The IXIT

The EFC supplier is responsible for archiving the Conformity Report at least during the period which the product is placed or is deployed on the Swedish EFC market.

The EFC supplier shall submit the Conformity Statement and the Conformity Appraisal Statement to SRA. The EFC supplier shall supply SRA with the other parts of the Conformity Report upon its request.

The SRA keeps a record of products for which conformity reports have been submitted, and thus have been deemed (by the EFC-supplier and the IR) to be conformant to the basic requirements [SwePaC]. This does not mean that SRA certifies the above-mentioned product; it is only information about which products that has been subject to conformance evaluation according to the specified procedures.

5 Test case methodology

The test cases define “what” and “how” to conduct conformity evaluation. The tests to be performed for conformity evaluation purposes, derived from [SwePaC], are defined using the methodology described in this chapter.

The conformity evaluation items are defined in tables using columns with the following meaning:

- Suite: a collection of closely related test cases.
- Id: unique identification number, within the context of this specification, of the test case - for referencing purposes. (test case + section number + sequence number)
- Name: description of the test case – describes “what”
- Requirement: reference to requirement in [SwePaC] or acceptance criteria
- Method: recommended method of evaluation for the concerned item, e.g. laboratory, refers to standard method whenever appropriate
- Remarks: highlighting of relevant information. E.g. test cases that form part of the essential radio test suites, for which a successful conformance evaluation entails presumption of conformity to [R&TTE, article 3.2], are highlighted in this column.

This test specification is extensively referencing the following underlying specifications and their associated test procedures:

- ETSI’s electromagnetic compatibility and radio spectrum test methods [ETSI DSRC, ETSI OBU and ETSI RSE] for assessment of radio frequency parameters associated with DSRC (P0/P1 parameter set L1-B).
- OBU conformance test procedures [EFC AID TESTS] for DSRC transaction assessment
- Chilean conformance tests [MOP TESTS] for DSRC (L2 Medium Access Control) performance assessment¹². Annex D provides, with MOPTT’s kind permission, an excerpt from [MOP TESTS] as such tests are not yet covered by any standard or publicly available specification.

Conformity evaluation items that are of similar nature are grouped into the same category in order to facilitate the reading and to reflect the structure of [SwePaC] - conformity evaluation categories:

- DSRC
- EFC transaction
- Security
- Data

The OBU test cases are defined in chapter 6, whereas the RSE test cases are defined in chapter 7.

¹² ETSI has adopted two work items for the purpose of developing DSRC-L2 and –L7 test procedures. The work will be carried-out by ERM/TG 37. It is the intention that future versions of this test specification will incorporate the results of these work items.

6 OBU conformance evaluation

6.1 DSRC

Table 6.1 below defines the test cases for OBU DSRC conformity evaluation. The corresponding requirements are formulated in 4 in [SwePaC].

Suite	Id	Name	Req	Method	Remarks
Radio / DSRC L1	TC 6.1-1	Dynamic range – sensitivity	P0/P1 parameter set L1-B	10.1.1 in [ETSI DSRC]	$P_{sens} \leq P_{11b} = -43\text{dBm}$ [7.2.1.2 in ETSI DSRC]
	TC 6.1-2	Dynamic range – Upper power limit of communication	P0/P1 parameter set L1-B	10.1.2 in [ETSI DSRC]	$P \leq P_{D11a} = -24\text{dBm}$ [7.2.1.3 in ETSI DSRC]
	TC 6.1-3	Cut-off power level	P0/P1 parameter set L1-B	10.2 in [ETSI DSRC]	-60 dBm [7.2.2 in ETSI DSRC]
	TC 6.1-4	Conversion gain	P0/P1 parameter set L1-B	10.3 in [ETSI DSRC]	$1 \leq G_c \leq 10\text{ dB}$ within a cone of $\theta = 35^\circ$ [7.2.3 in ETSI DSRC]
	TC 6.1-5	Maximum equivalent isotropically radiated power	P0/P1 parameter set L1-B	10.4 in [ETSI DSRC]	[7.2.4 in ETSI DSRC]. Part of the Essential radio test suites in [ETSI OBU]
	TC 6.1-6	Frequency error	P0/P1 parameter set L1-B	10.5 in [ETSI DSRC]	$ \Delta f_s \leq 0,1\%$ [7.2.5 in ETSI DSRC] Part of the Essential radio test suites in [ETSI OBU]
	TC 6.1-7	Transmitter spectrum mask	P0/P1 parameter set L1-B	10.6 in [ETSI DSRC]	[7.2.6 in ETSI DSRC]. Part of the Essential radio test suites in [ETSI OBU]
	TC 6.1-8	Transmitter spurious and out-of-band emissions	P0/P1 parameter set L1-B	10.7 in [ETSI DSRC]	[7.2.7 in ETSI DSRC] Part of the Essential radio test suites in [ETSI OBU]
	TC 6.1-9	Receiver spurious emissions	P0/P1 parameter set L1-B	10.8 in [ETSI DSRC]	[7.2.8 in ETSI DSRC] Part of the Essential radio test suites in [ETSI OBU]
DSRC (L2 MAC) performance	TC 6.1-10	Timing for public uplink windows	P0/P1 parameter set L1-B	6.8.1 in [MOP TESTS]	$T_3 (160\text{ us}) < t < T_3 + T_{4b} (192\text{ us})$
	TC 6.1-11	Timing for private uplink windows	P0/P1 parameter set L1-B	6.8.2 in [MOP TESTS]	$T_3 (160\text{ us}) < \text{start time} < T_3 + T_{4a} (496\text{ us})$ End time $< T_3 + N_3 + \text{overhead} / U_8 (t = 5496\text{ us})$

Suite	Id	Name	Req	Method	Remarks
	TC 6.1-12	Uplink to downlink turn around – OBU TX to RX mode	P0/P1 parameter set L1-B	6.8.3 in [MOP TESTS]	
DSRC - communication blocked recovery	TC 6.1-13	Communication blocked	P0/P1 parameter set L1-B	TC42-A in [EFC AID TESTS]	
	TC 6.1-14	Communication blocked: 300s	P0/P1 parameter set L1-B	TC42-B in [EFC AID TESTS]	
DSRC – ACn recovery ¹³	TC 6.1-15	Fast access	P0/P1 parameter set L1-B	TC41-A in [EFC AID TESTS]	
	TC 6.1-16	Slow access	P0/P1 parameter set L1-B	TC41-B in [EFC AID TESTS]	
DSRC initialisation recovery	TC 6.1-17	PrWRq – VST lost	P0/P1 parameter set L1-B	TC40-A in [EFC AID TESTS]	
DSRC – Initialisation	TC 6.1-18	Profile handling	P0/P1 parameter set L1-B	TC01-A in [EFC AID TESTS]	Steps 1-8, 11-12
	TC 6.1-19	Application Id handling	P0/P1 parameter set L1-B	TC01-B in [EFC AID TESTS]	Steps 1-8
	TC 6.1-20	Time handling	P0/P1 parameter set L1-B	TC01-C in [EFC AID TESTS]	
	TC 6.1-21	Beacon Id handling	P0/P1 parameter set L1-B	TC01-D in [EFC AID TESTS]	
OBU state transitions	TC 6.1-22	OBU State transitions	OBU behaviour according to 6.3 in [GSS]	Assess the 68 events in Table 6.6 in [GSS] through PoO and PoC (as defined in [EFC AID TESTS])	Assess the behaviour (i.e. action and next state) in a known state with a known event.
OBU DSRC L2 frames	TC 6.1-23	Downlink frames and fragmentation header	Frames 1-2, 4-7 as defined in table 4 in [EN Profiles] and 1 octet fragmentation header		Assess the 6 frames and behaviour, through PoO and PoC (as defined in [EFC AID TESTS])
	TC 6.1-24	Uplink frames and fragmentation header	Frames 1-6 as defined in table 5 in [EN Profiles] and 1 octet fragmentation header		Assess the 6 frames and behaviour, through PoO and PoC as defined in [EFC AID TESTS]
L7 functionality	TC 6.1-25	Concatenation of T-APDUs	Concatenation of multiple consecutive T-APDUs in 1 L2 frame		2 consecutive T-APDUs, assess through PoO and PoC as defined in [EFC AID TESTS]

Table 6.1 DSRC conformity evaluation items

¹³ The supplier shall state whether the OBU under test makes use of slow or fast data access. TC41-A or TC41-B shall be executed according to the implemented access method.

6.2 EFC transaction

Table 6.2 below defines the test cases for OBU EFC transaction conformity evaluation. The corresponding requirements are formulated in 5 in [SwePaC]. Note that the test cases for GET, SET and GET_STAMPED are placed under 6.3, as they comprise security related elements.

Suite	Id	Name	Req	Method	Remarks
EFC transaction model – application specific content	TC 6.2-1	OBU application specific content VST	EFC transaction model	Assess the VST content through PoO and PoC (as defined in [EFC AID TESTS])	EFC application –specific contents of the VST 6.2.3 in [EFC AID]
DSRC L7 EVENT_REPORT RELEASE	TC 6.2-2	EVENT-REPORT RELEASE	EFC transaction model	TC02-A in [EFC AID TESTS]	
EFC functions	TC 6.2-3	SET_MMI	Table 5.3	TC20-A [EFC AID TESTS]	
	TC 6.2-4	ECHO	Table 5.3	TC25-A [EFC AID TESTS]	
EFC transaction functionality	TC 6.2-5	CARDME	5.1 and 5.1.2 in [SwePaC]	TC30-A in [EFC AID TESTS]	
	TC 6.2-6	PISTA	5.1 and 5.1.1 in [SwePaC]	Analogous to TC30-A	

Table 6.2 EFC transaction evaluation items

6.3 Security

Table 6.3 below defines the test cases for OBU security conformity evaluation. The corresponding requirements are formulated in Table 5.3 and 6 in [SwePaC].

Suite	Id	Name	Req	Method	Remarks
EFC security functions	TC 6.3-1	GET	Table 5.3, 6.3	TC03-A [EFC AID TESTS]	
	TC 6.3-2	SET	Table 5.3, 6.3	TC04-A [EFC AID TESTS]	
	TC 6.3-3	GET_STAMPED	Table 5.3, 6.2 and 6.3	TC10-A	Contract Authenticator for a PISTA and PaymentMeans for a CARDME personalised OBU, respectively.

Table 6.3 Security evaluation items

6.4 Data

Table 6.4 below defines the test cases for OBU data attributes transaction conformity evaluation. The corresponding requirements are formulated in 7 and in Annex D in [SwePaC].

Suite	Id	Name	Req	Method	Remarks
Data	TC 6.4-1	EFC data attributes – a) Read using wrong access credentials b) read using right access credentials c) write with wrong access credentials d) write with right access conditions e) read with right access credentials	7 and Annex D	To be performed on each individual attribute – except for AttrId 0 for which step 'a)' is N/A a) GET (wrong AC_CR) b) GET (right AC_CR) c) SET (wrong AC_CR) d) SET (right AC_CR) e) GET (right AC_CR)	a) Should result in non-retrieval b) should result in retrieval c) should result in non-writing d) should result in writing e) should result in reading of value that is equal to step d)

Table 6.4 Data evaluation items

7 RSE conformance evaluation

7.1 DSRC

Table 7.1 below defines the test cases for RSE DSRC conformity evaluation. The corresponding requirements are formulated in 4 in [SwePaC].

Suite	Id	Name	Req	Method	Remarks
Radio / DSRC L1	TC 7.1-1	Modulation index	P0/P1 parameter set L1-B	9.1 in [ETSI DSRC]	$0.5 \leq \text{modulation index} \leq 0.9$
	TC 7.1-2	Dynamic range – RSU sensitivity	P0/P1 parameter set L1-B	9.2.1 in [ETSI DSRC]	
	TC 7.1-3	Dynamic range – RSU upper power limit for communication	P0/P1 parameter set L1-B	9.2.2 in [ETSI DSRC]	
	TC 7.1-4	Intermodulation immunity	P0/P1 parameter set L1-B	9.3 in [ETSI DSRC]	
	TC 7.1-5	Co-channel rejection	P0/P1 parameter set L1-B	9.4 in [ETSI DSRC]	
	TC 7.1-6	Blocking	P0/P1 parameter set L1-B	9.5 in [ETSI DSRC]	
	TC 7.1-7	Selectivity	P0/P1 parameter set L1-B	9.6 in [ETSI DSRC]	
	TC 7.1-8	Maximum equivalent isotropically radiated power	P0/P1 parameter set L1-B	9.7 in [ETSI DSRC]	Part of the Essential radio test suites in [ETSI RSE]
	TC 7.1-9	Frequency error	P0/P1 parameter set L1-B	9.8 in [ETSI DSRC]	Part of the Essential radio test suites in [ETSI RSE]
	TC 7.1-10	Transmitter spectrum mask	P0/P1 parameter set L1-B	9.9 in [ETSI DSRC]	Part of the Essential radio test suites in [ETSI RSE]
	TC 7.1-11	Transmitter spurious and out-of-band emissions	P0/P1 parameter set L1-B	9.10 in [ETSI DSRC]	Part of the Essential radio test suites in [ETSI RSE]
	TC 7.1-12	Receiver spurious emissions	P0/P1 parameter set L1-B	9.11 in [ETSI DSRC]	Part of the Essential radio test suites in [ETSI RSE]
DSRC (L2 MAC) performance	TC 7.1-13	PuW timing	P0/P1 parameter set L1-B	PoO and POC, as defined [EFC AID TESTS]	Analogous to 6.8.1 [MOP TESTS] for the OBU.
	TC 7.1-14	PrW timing	P0/P1 parameter set L1-B	PoO and POC, as defined [EFC AID TESTS]	Analogous to 6.8.2 [MOP TESTS] for the OBU.
	TC 7.1-15	Uplink to downlink turn around – OBU TX to RX mode	P0/P1 parameter set L1-B	PoO and POC, as defined [EFC AID TESTS]	Analogous to 6.8.3 [MOP TESTS] for the OBU.

Suite	Id	Name	Req	Method	Remarks
DSRC - communication blocked recovery	TC 7.1-16	Communication blocked	P0/P1 parameter set L1-B	Analogous to TC42-A in [EFC AID TESTS]	
	TC 7.1-17	Communication blocked: 300s	P0/P1 parameter set L1-B	Analogous to TC42-B in [EFC AID TESTS]	
DSRC – ACn recovery	TC 7.1-18	Fast access recovery functions: GET/SET-Res lost	P0/P1 parameter set L1-B	Analogous to TC41-A in [EFC AID TESTS]	
	TC 7.1-19	Slow access recovery functions: GET/SET-Res lost	P0/P1 parameter set L1-B	Analogous to TC41-B in [EFC AID TESTS]	
DSRC initialisation recovery	TC 7.1-20	PrWRq – VST lost	P0/P1 parameter set L1-B	Analogous to TC40-A in [EFC AID TESTS]	
	TC 7.1-21	Handling of Initialisation – PrWRq, VST lost???	P0/P1 parameter set L1-B	Analogous to TC40-A in [EFC AID TESTS]	
DSRC – Initialisation	TC 7.1-22	Profile handling	P0/P1 parameter set L1-B	Analogous to TC01-A in [EFC AID TESTS]	Steps 1-2 or 3-4. Covers application id handling with EFC as a mandatory application.
	TC 7.1-23	Time handling	P0/P1 parameter set L1-B	Analogous to TC01-C in [EFC AID TESTS]	
	TC 7.1-24	Beacon Id handling	P0/P1 parameter set L1-B	Analogous to TC01-D in [EFC AID TESTS]	
OBU state transitions	TC 7.1-25	OBU State transitions	OBU behaviour according to 6.3 in [GSS]	Assess the 68 events in Table 6.6 in [GSS] through PoO and PoC (as defined in [EFC AID TESTS])	Assess the behaviour (i.e. action and next state) in a known state with a known event.
OBU DSRC L2 frames	TC 7.1-26	Downlink frames and fragmentation header	Frames 1-2, 4-7 as defined in table 4 in [EN Profiles] and 1 octet fragmentation header		Assess the 6 frames and behaviour, through PoO and PoC (as defined in [EFC AID TESTS])
	TC 7.1-27	Uplink frames and fragmentation header	Frames 1-6 as defined in table 5 in [EN Profiles] and 1 octet fragmentation header		Assess the 6 frames and behaviour, through PoO and PoC (as defined in [EFC AID TESTS])
L7 functionality	TC 7.1-28	Concatenation of T-APDUs	Concatenation of multiple consecutive T-APDUs in 1 L2 frame		Assess the behaviour for 2 consecutive T-APDUs, through PoO and PoC (as defined in [EFC AID TESTS])

Table 7.1 DSRC conformity evaluation items

7.2 EFC transaction

Table 7.2 below defines the test cases for RSE EFC transaction conformity evaluation. The corresponding requirements are formulated in 5 in [SwePaC]. Note that the test cases for GET, SET and GET_STAMPED are placed under 7.3, as they comprise security related elements.

Suite	Id	Name	Req	Method	Remarks
EFC transaction model – application specific content	TC 7.2-1	RSE application specific content VST	EFC transaction model	Assess the BST content through PoO and PoC as defined in [EFC AID TESTS]	EFC application –specific contents of the BST 6.2.2 in [EFC AID]
DSRC L7 EVENT_REPORT RELEASE	TC 7.2-2	EVENT-REPORT RELEASE	EFC transaction model	Analogous to TC02-A in [EFC AID TESTS]	
EFC functions	TC 7.2-3	SET_MMI	Table 5.3	Analogous to TC20-A [EFC AID TESTS]	According to Annex C.2.4.1 in [EFC AID TESTS]
	TC 7.2-4	ECHO	Table 5.3	Analogous to TC25-A [EFC AID TESTS]	According to Annex C.2.5.1 in [EFC AID TESTS]
EFC transaction functionality	TC 7.2-5	CARDME		Analogous to TC30-A in [EFC AID TESTS]	
	TC 7.2-6	PISTA		Analogous to TC30-A	

Table 7.2 EFC transaction evaluation items

7.3 Security

Table 7.3 below defines the test cases for RSE security conformity evaluation. The corresponding requirements are formulated in Table 5.3 and 6 in [SwePaC].

Suite	Id	Name	Req	Method	Remarks
EFC security functions	TC 7.3-1	GET	Table 5.3, 6.3	TC03-A [EFC AID TESTS]	
	TC 7.3-2	SET	Table 5.3, 6.3	TC04-A [EFC AID TESTS]	
	TC 7.3-3	GET_STAMPED	Table 5.3, 6.2 and 6.3	TC10-A	Contract Authenticator for a PISTA and PaymentMeans for a CARDME personalised OBU, resp.
	TC 7.3-4	Transaction counter	6.1	Read, increment and check transaction counter by means of 2 nd read	
	TC 7.3-5	Signed receipt	6.1		According to PSP or ICS
	TC 7.3-6	Vehicle authenticator	6.1		According to PISTA (or ICS).
	TC 7.3-7	Contract authenticator	6.1		According to PISTA

Table 7.3 Security evaluation items

7.4 Data

Table 7.4 below defines the test cases for RSE data attributes conformity evaluation. The corresponding requirements are formulated in 7 and in Annex D in [SwePaC].

Suite	Id	Name	Req	Method	Remarks
Data	TC 7.4-1	EFC data attributes	7 and Annex D	Inspection of data value assignments	

Table 7.4 Data evaluation items

ANNEX A – NOTIFICATION FOR EVALUATION OF CONFORMITY

The following form should be completed by the party who intends to perform evaluation of OBU or RSE conformity to the basic requirements, as defined in [SwePaC], and be sent either by normal mail or faxed to:

Swedish Road Administration

Attn. Mr. Christer Rydmell
S-781 87 Borlänge
Sweden
Fax: +46 243-758 25

Applicant party	Name Address Phone / Fax E-mail
Manufacturer (if different from the applicant)	Name Address
Product(s) – category (OBU or RSE) and marking	Product category Model/type Data Other specification Name/trade mark/logo
Organisation and persons intended to serve as the “Independent Reviewer” Credentials that prove the organisation’s and person’s suitability to perform the Independent Reviewer role (see Annex B) shall be enclosed with the completed notification	Organisation Name of reviewer(s) Address Phone / Fax E-mail
Signature of person authorized to sign on behalf of the applicant	Place and date Signature Name
For SRA’s internal use only – please do not complete	SRA reference Date Handled by

ANNEX B – REQUIREMENTS ON AN INDEPENDENT REVIEWER

This annex defines the requirements for an organisation to fulfil the role of an Independent Reviewer (IR) for evaluation of OBU or RSE conformity to the basic requirements, as defined in [SwePaC]. SRA will express its opinion whether it deems the organisation proposed by the applicant fit to fulfil the Independent Reviewer role. SRA will communicate its opinion, and motivation in case of non-recognition of the proposed IR, to the applicant.

Competence requirements

Profound know-how in EFC, DSRC and testing in general, in particular the contents of the following documents:

- [SwePaC]
- [EN L1]
- [EN L2]
- [EN L7]
- [EN Profiles]
- [EFC AID]
- Testing and test methods, based on [ISO/IEC 17025] or equivalent
- [ETSI DSRC]
- [ETSI RSE]
- [ETSI OBU]
- [EFC AID TESTS]
- [MOP TESTS, see Annex D]

The IR may be asked to submit relevant project references and CV's to demonstrate its competence in the areas listed above.

Quality assurance requirements

- The IR service should be quality assured according to [ISO 9001] or equivalent

Other requirements

- independence from all EFC-suppliers
- quality of similar assessment activities should never have been questioned on good grounds
- lawful business practise – i.e. none of the cases quoted under Article 29 in [92/50/EEC] apply to the suggested IR's organisation

ANNEX C – CONFORMITY REPORT CHECK LIST

This annex provides a check list of the documents, and their key elements, to be prepared as part of the conformity report (see 4.4):

Conformity statement

- Applicant party
- Product type / marking
- Reference to other documents (conformity appraisal statement, final test report, final test plan, ICS and IXIT)
- CE marking
- Declaration of conformity to SwePaC, and evaluation according to this Test Specification
- Signature of person authorized to sign on behalf of the applicant

Conformity appraisal statement (prepared by IR)

- Name and contact details of the IR
- Conformity appraisal object
 - Applicant party
 - Product type / marking
 - Reference to assessed documents (final test report, ICS and IXIT)
- Opinion on the conformity of the appraisal object
- Signature of person authorized to sign on behalf of the IR

Final test report

- identification of evaluated implementation
- test equipment
- test set-out
- test case
- identification of test log record
- overall test verdict

Final test plan

- identification of the evaluated implementation
- how conformity is to be assessed highlighting similarities and differences, with motivation, with the test cases defined in 6 and 7 in this Test Specification for the OBU and RSE, respectively
- the usage of existing test results for the similar or same product with motivation
- who performed the testing / evaluation and analysis
- used test facilities, tools and test scripts

Implementation conformance statement

- completion of ICS proforma in Annex B in [EFC AID TESTS]

Implementation extra information for testing

- completion of IXIT proforma in Annex C in [EFC AID TESTS]

ANNEX D– DSRC LAYER 2 PERFORMANCE TEST CASES

This annex provides, with MOPTT’s kind permission, an excerpt from [MOP TESTS] as such tests are not yet covered by any standard or publicly available specification.

Note that the chapter numbering in this annex is according to [MOP TESTS], as this is an excerpt of the document. The following clarifications are needed in order to render the annex self-contained:

- reference to 5.1: replaced by PoO and PoC as defined in [EFC AID TESTS]
- according to 4.1: replaced by according to [SwePaC]
- according to 5.1.2: replaced by according to [SwePaC]
- according to C.1.x in [MOPTT_ST1]: replaced by according to [SwePaC]
- reference to Table 6.x: replaced by according to [SwePaC]
- reference to [CEN_L2]: replaced by [EN L2]

The text in the rest of this annex is an excerpt from [MOP TESTS].

6.8 TC08: DSRC Performance

6.8.1 TC08-A: Timing for Public Windows

The purpose of this test is to verify the correct start and stop of OBE transmissions in public uplink windows.

6.8.1.1 Equipment and Set-up

The test set-up shall be according to what is described in 5.1.

OBEs according to 4.1 shall be used.

The equipment shall be placed in such a way that optimal communication can be foreseen.

6.8.1.2 Main Execution Steps

STEP	ACTION	EXPECTED RESPONSE	NOTE
1	Configure the BST according to 5.1.2. Send BST every (5-10) ms until an uplink frame is received.	PrWRq according to C.1.2 in [MOP_T1.1] in one of the three public windows.	A detector shall measure the time from the last bit of the RSE stop flag till the first bit of received OBE start flag, and from there to the last bit of the received OBE stop flag. Note the time for start of received OBE frame (including preamble) and end of received OBE frame (including postamble) relative to RSE frame end.
2	Repeat 999 times step 1.		
3	Modify the initialisation sequence so that the guard time after the BST (length T3) is completely filled with random bits. Send BST every (5-10) ms until an uplink frame is received.	PrWRq according to C.1.2 in [MOP_T1.1] in one of the three public windows.	Note the time for start of received OBE frame (including preamble) and end of received OBE frame (including postamble) relative to RSE frame end.
4	Repeat 999 times step 3		

All observed anomalies, problems and unusual events during execution of the test shall be noted.

6.8.1.3 Acceptance Criteria

ITEM	ACCEPTANCE CRITERIA	LIMIT	NOTE
	OBE transmissions in public uplink windows.	According to Table 6.2	Verify that all received frames within public uplink windows are within the limits. The effect of the presence of load frames and extra flags shall be reported. Note that all timing above is relative to the last bit of the stop flag of the BST, and must be corrected because timing is measured relative to last bit of start flag.

Public uplink windows are here numbered #1, #2 and #3, meaning 1st, 2nd and 3rd public uplink window following the BST, respectively.

Table 6.2: Public Up-link Window Timing Limits

Window	Start time	End time
#1	$T3 < t < T3 + T4b$ (160 μ s < t < 192 μ s)	$t < T3 + T5$ (t < 608 μ s)
#2	$T3 + T5 < t < T3 + T5 + T4b$ (608 μ s < t < 640 μ s)	$t < T3 + 2 \cdot T5$ (t < 1056 μ s)
#3	$T3 + 2 \cdot T5 < t < T3 + 2 \cdot T5 + T4b$ (1056 μ s < t < 1088 μ s)	$t < T3 + 3 \cdot T5$ (t < 1504 μ s)

NOTE:

For technical reasons, all timing measurements may be made with a device in the RSE detecting the last bit of flag sequences, given that the measured timings can be corrected with the known duration of frame elements to give the timing values referred to the timing reference points defined in 7.3.4 in [CEN_L2].

6.8.2 TC08-B: Timing for private uplink windows

The purpose of this test is to verify the correct start and stop of several private uplink window transmissions.

6.8.2.1 Equipment and Set-up

The test set-up shall be according to what is described in 5.1.
 OBEs according to 4.1 shall be used.

The equipment shall be placed in such a way that optimal communication can be foreseen.

6.8.2.2 Main Execution Steps

STEP	ACTION	EXPECTED RESPONSE	NOTE
1.	Configure the BST according to 5.1.2. Send BST every (5-10) ms until an uplink frame is received.	PrWRq according to C.1.2 in [MOP_T1.1].	A detector shall measure the time from the last bit of the RSE stop flag till the first bit of received OBE start flag, and from there to the last bit of the received OBE stop flag.
2.	Send PrWA according to C.1.3 in [MOP_T1.1].	VST according to C.1.4 in [MOP_T1.1]. The VST frame shall in all cases be within the time windows, measured from the last bit of the RSE stop flag.	Note the time for start of received VST frame (including preamble) and end of received VST frame (including postamble) in the private uplink window.
3.	Repeat 999 times steps 2 and 3.		

All observed anomalies, problems and unusual events during execution of the test shall be noted.

6.8.2.3 Acceptance Criteria

ITEM	ACCEPTANCE CRITERIA	LIMIT	NOTE
	OBE transmissions in private uplink windows.	According to Table 6.3	The frame received from the OBE shall in all cases be within the time windows, measured from the last bit of the RSE stop flag.

Table 6.3: Private Up-link Window Timing Limits

Start time	End time
$T3 < t < T3 + T4a$ (160 μ s < t < 496 μ s)	$t < T3 + (N3+overhead)/U8$ (t < 5496 μ s)

6.8.3 TC08-C: OBE Uplink to Downlink Turn Around Time

The purpose of this test is to verify that, after transmission, the OBE is able to receive the first arriving frame afterwards (i.e. OBE Tx to Rx mode switching mode). This is the time from the last bit of the postamble transmitted, till the OBE is able to receive the preamble of an incoming frame. This test assumes that premature termination of uplink frames is allowed.

6.8.3.1 Equipment and Set-up

The test set-up shall be according to what is described in 5.1.
 OBEs according to 4.1 shall be used.

The equipment shall be placed in such a way that optimal communication can be foreseen.

6.8.3.2 Main Execution Steps

The RSE shall be set up to respond to a private uplink window request by, in the immediately following frame, allocating a private uplink window for the OBE. The preamble of the immediately following frame shall start T1 after receiving the last bit of the stop flag of the OBE transmitted frame. The steps according to the tables below shall be executed.

STEP	ACTION	EXPECTED RESPONSE	NOTE
1.	Configure the BST according to 5.1.2.. Send BST every (5-10) ms until an uplink frame is received.	PrWRq according to C.1.2 in [MOP_T1.1].	A detector shall measure the time from the last bit of the RSE stop flag till the first bit of received OBE start flag, and from there to the last bit of the received OBE stop flag. The preamble of the immediately following frame shall start T1 (= 32 μ s) after receiving the last bit of the stop flag of the OBE transmitted frame
2.	Send PrWA according to C.1.3 in [MOP_T1.1].	VST according to C.1.4 in [MOP_T1.1].	The RSE shall start transmitting the PrWA start T1 (= 32 μ s) after receiving the last bit of postamble associated with the PrWRq frame. Note whether the OBE responds with its VST in the allocated private uplink window. The RSE shall not reallocate the private uplink window. For this test, the arrival of a VST shall be termed successful, while no VST shall be termed a failure.
3.	Repeat 99 times steps 1 and 2.		

All observed anomalies, problems and unusual events during execution of the test shall be noted. In case of failure, then the start time of the transmission of the PrWA shall be modified to T1+C, where C is increased (e.g. in steps of 5 μ s) until the VST is properly received. The value of C shall be part of the Test result documentation.

6.8.3.3 Acceptance Criteria

ITEM	ACCEPTANCE CRITERIA	LIMIT	NOTE
	OBE uplink to downlink turn around time – Reception of VST	The VST shall always be successfully received for $C \leq 5 \mu$ s	The preamble of the immediately following frame shall start T1+C after receiving the last bit of the stop flag of the OBE transmitted frame.