

Austrian HGV Tolling System

EETS Acceptance Procedures

For information only

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| Document Reference | Version | Status | Security | Date |
|---------------------------|----------------|---------------|-----------------|-------------|
| [EETS_acc] | V3.0 | released | | 14.06.2017 |

History

| Version | Date | Modification | Established | Approved |
|---------|------------|---|-------------|----------|
| 2.21 | 21.03.2013 | First release | HHA | |
| 2.22 | 09.07.2014 | Minor clarifications an editorial changes; duration of pilot operation | HHA | MHA |
| 2.23 | 10.10.2014 | clarifications in ch. 5.6 (pilot operation) | HHA | MHA |
| 2.25 | 21.07.2016 | Editorial changes (Supplier dependent names of RSE components removed); supplementation of test cases | HHA | |
| 2.3 | 02.11.2016 | New release (Editorial changes) | HHA | |
| 2.4 | 22.05.2017 | Several updates and E2E tests added | AKA | HHA |
| 3.0 | 14.06.2017 | New release | HHA | FHV |

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Abbreviations and Glossary

| Abbreviation, Term | Description |
|--------------------|--|
| CE | Conformity Declaration |
| CEN | European Committee for Standardization |
| DSRC | Dedicated Short Range Communication |
| DUT | Device under test |
| EETS | European Electronic Toll Service |
| EFC | Electronic Fee Collection |
| EN | European standards |
| EP | EETS provider |
| ETSI | European Telecommunications Standards Institute |
| HGV | Heavy Goods Vehicle |
| ISO | International Organization for Standardization |
| ISO/DIS | ISO Draft International Standard |
| MMI | Men Machine Interface |
| OBE | On-Board Equipment |
| PCTR | Proforma Conformance Test Report |
| PICS | Protocol Implementation Conformance Statement |
| PKE | Portable enforcement device (Portable Kontrolleinrichtung), used in combination with a MAS |
| REETS | Regional European Electronic Toll Service |
| RSE | Road Side Equipment |
| SU | Service User |
| TC | Toll Charger (e.g. ASFINAG) |
| TSP | Toll Service Provider (e.g. the EETS provider) |

References

All references are listed in Annex B - References of this document. For dated references, subsequent amendments to or revisions of any of these publications apply only when incorporated in it by amendment or revision. For undated references, the latest edition of the referenced publication applies.

1 Purpose and scope

This document specifies the ASFINAG acceptance procedures for an EETS Provider. The acceptance procedures define the conformity declarations and test processes for

- the EETS On-Board Equipment (OBE) with DSRC transactions according to EN 15509 and
- the back office interface from EETS Provider to ASFINAG via the EasyGo Hub.

The current document "EETS Acceptance Procedures" is the base for the final acceptance of an EETS Provider. A successful passing of the acceptance procedures will result in the "Suitability for Use" certification of the tested EETS OBE as well as of the EETS Provider's back office interface to the Austria HGV tolling system.

2 Process overview

The acceptance procedures define the assessment methodology for the “Suitability for Use” tests of an OBE in connection with the EETS Providers back office interface in the ASFINAG EETS toll context. The successful approval is only valid for the tested OBE with the tested software version and the back office interface version used at testing.

The EETS acceptance procedures are divided in three main phases:

- the Conformity to Specification Declaration,
- the Suitability for Use tests and
- the monitoring during the pilot operation phase.

A recertification process of an EETS Provider is started after a relevant software or hardware change.

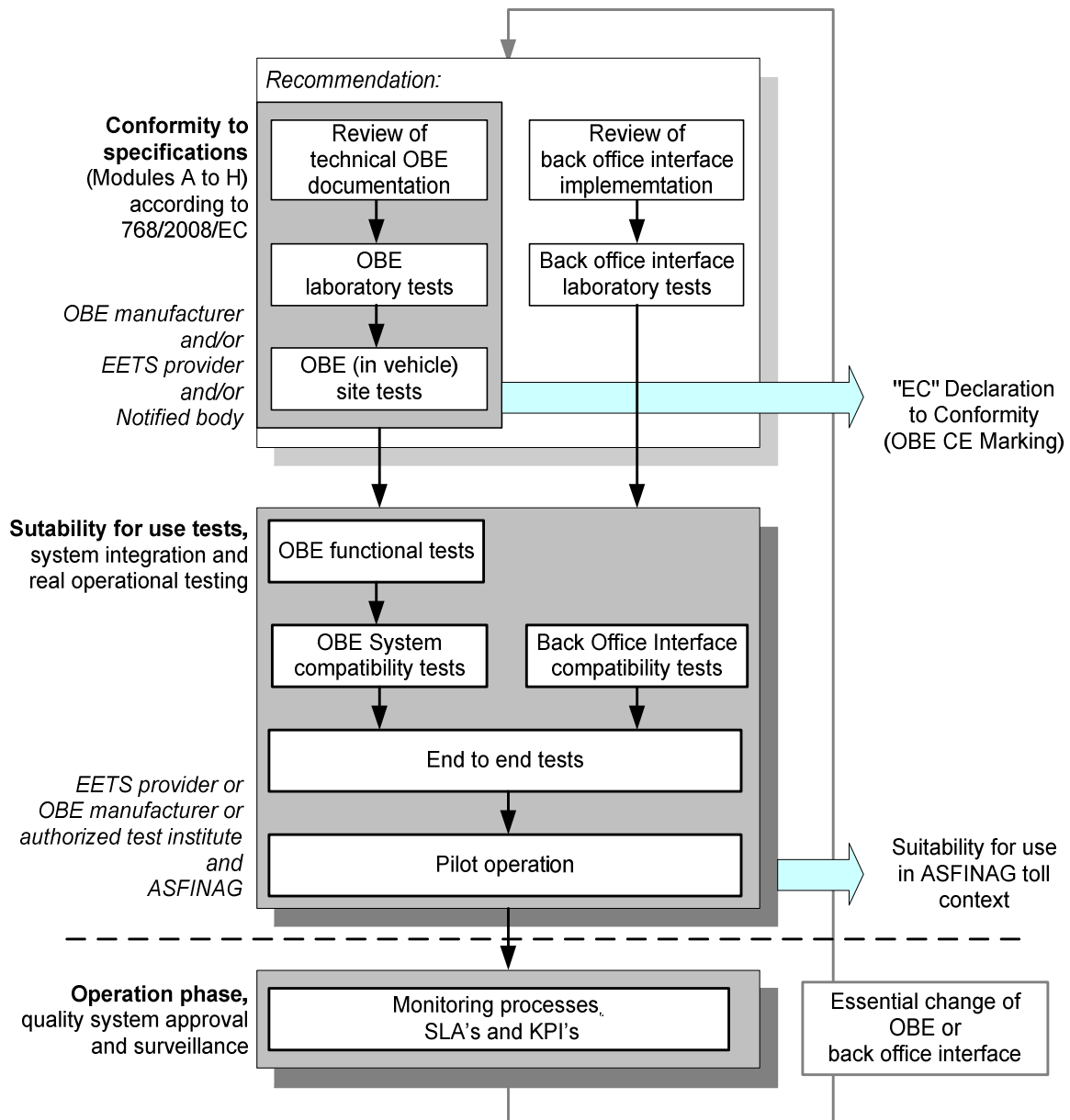


Figure 1: Acceptance procedures overview

2.1 Conformity to specification declaration

The conformity to specification declaration for an OBE contains the CE certification of the OBE to all relevant standards with the conformity statements, the certificate(s) including the evaluation report(s) and the detailed test reports. It also contains the conformity declaration to ASFINAG's EETS-OBE Requirement Specification [EETS-OBE_req]. The declaration shall be delivered by the OBE manufacturer or the EETS Provider.

The *Figure 1: Acceptance procedures overview* contains inside the top box a recommendation for the test and verification process resulting in the “EC declaration to conformity”.

In addition to the conformity declaration of the OBE also a conformity declaration of the EETS Providers back office interface according to the ASFINAG requirements is required.

2.2 Suitability for Use tests

The Suitability for Use tests cover all aspects of the DSRC communication, back office data exchange, performance and service level agreement monitoring as well as security and privacy issues. The “Suitability for Use tests” phase is divided in the following sequence of four test steps:

1. Functional tests, e.g. transaction reliability tests, etc.
2. OBE system compatibility tests (Functional tests in laboratory, at a test site and for roadside equipment not available at the test site at production system components)
3. Back office interface tests in a test environment (Integration tests)
4. End to end tests with the OBE in the operational EFC environment to check all required business processes
5. Pilot operation phase with a limited number of OBE and a limited time frame

These test steps shall be performed in cooperation between ASFINAG and the EETS Provider or OBE manufacturer or in cooperation between ASFINAG and an authorized representative test institute. However, the responsibility for the test phase remains with the EETS Provider.

2.3 Operation phase - recertification process

During the system operation a planned change of the OBE hardware or software shall be reported to ASFINAG before introduced in the ASFINAG toll context.

- “The OBE software or hardware change” report is the base for the decision concerning which phases and steps of the approval process shall be repeated for the recertification of the OBE. It is expected, that the manufacturer performs a set of

basic DSRC tests after each OBE software change, also in case of only a small software change without the necessity of a recertification.

- A change of the back office interface is only possible after agreement with ASFINAG. Such a change shall be handled by a process agreed between the EETS Provider and ASFINAG based on the impact of the interface change. This process is outside the scope of the current document.

For details of the change and incident management see [EETS_proc].

3 Conformity to specification declaration for OBE

3.1 General

The “OBE declaration of conformity to specifications” is relative to the requirements of Directive 2004/52/EC, Decision 2009/750/EC and all relevant standards and technical specifications. Depending on the chosen module (from Decision 2008/768/EC (CE Conformity Marking)), the “EC” Declaration of Conformity to specifications, to be drawn up by the manufacturer, shall cover the manufacturer’s self-assessment and/or shall be subject to obtaining an examination certificate from a Notified Body.

The conformity declaration shall in particular consider conformity of the OBE

- to the DSRC transaction according to EN 15509 and related DSRC standards; and
- to the requirements defined in EETS-OBE Requirements Specification [EETS-OBE req] and the related documents.

Conformity to specifications shall be reassessed in case of a significant modification of the OBE or when the Notified Body’s certificate is expired. The following (not exhaustive) list defines the most relevant modification cases of the OBE for the ASFINAG toll context:

- Change of the DSRC hardware (e.g. change the DSRC tag manufacturer, use of a different tag from the same manufacturer, etc.)
- Modification of the DSRC software stack
- Modification of the OBE hardware or software architecture (e.g. change the main OBE processor, introduce a new task in the software, modification of the inter task communication, etc.)
- Modification of the OBE operating system
- Additional (new) OBE functionality
- Etc.

The final decision about a required reassessment of the OBE conformity declaration and hence also a new cycle of the approval process is up to ASFINAG based on the detailed change description (see chapter 6 Recertification process). The decision will be taken in cooperation with the EETS Provider and/or OBE manufacturer.

3.2 OBE Conformity declaration constituents

3.2.1 CE marking and declaration

The Manufacturer shall affix CE markings to the packaging where feasible. In compliance with Annex IV of Decision 2009/750/EC, a CE marking relative to EETS is accompanied by a Declaration, which will clearly specify that it concerns conformity to specifications. This “EC” Declaration should contain all relevant information to identify

- the OBE which is declared to be conform
- the European legislation according to which it is issued
- the manufacturer or its authorized representative
- the Notified Body if applicable
- reference to relevant standards
- other normative or required documents as appropriate

The EC declaration of conformity shall have the model structure set out in Annex III of Decision No 2008/768/EC.

3.2.2 OBE manufacturer examination certificates and reports

Depending on the chosen modules from 2008/768/EC, the following documents shall be provided by the EETS Provider (or by the manufacturer):

Module A - Internal production control:

- None (manufacturer's technical documentation at the disposal of national authorities)

Module B – EC- Type examination:

- The EETS Provider/Manufacturer shall provide the EC-type examination certificate and the evaluation report containing the results of the systematic examination of the extent to which the OBE and/or the manufacturer fulfills the specific functional and quality system requirements.

Module C - Conformity to type based on internal production control

Module C1 - Conformity to type based on internal production control plus supervised product testing

Module C2 - Conformity to type based on internal production control plus supervised product checks at random intervals

Module C, C1 and C2 require EC-type examination certificate (module B)

Module D – Conformity to type based on quality assurance of the production process

Module D requires EC-type examination certificate (module B)

Module D1 – Quality assurance of the production process

Module E – Conformity to type based on product quality assurance:

- Visit and/or audit report of production quality system (e.g. ISO 9001 quality management certificate)

Module E requires EC-type examination certificate (module B)

Module E1 – Quality assurance of final product inspection and testing:

- Visit and/or audit report of production quality system (e.g. ISO 9001 quality management certificate).

Module F – Conformity to type based on product verification:

- Certificate of conformity (in respect with the examinations and tests).
- Module F requires EC-type examination certificate (module B).

Module F1 – Conformity based on product verification

- Certificate of conformity (in respect with the examinations and tests)

Module G – Conformity based on unit verification:

- Certificate of conformity (in respect with the examinations and tests)

Module H – Conformity based on full quality assurance:

- Quality system assessment report (for the design and production phase, including for example an ISO 9001 quality management certificate)

Module H1 – Conformity based on full quality assurance plus design examination:

- Certificate of conformity (in respect with the examinations and tests)
- EC design examination certificate.

3.2.3 Test reports

The manufacturer and/or the Notified Body shall provide detailed test reports from all performed DSRC relevant OBE tests. The following, not exhaustive list shows the expectation of the performed DSRC interoperability tests:

- OBE tests defined in EN 15876-1 [IAP TEST] for all layers
- a set of tests comparable to the tests defined in chapter 5.2 of the current document.

The OBE test results of EN 15876-1 shall be reported by the Proforma Conformance Test Report (PCTR) defined in Annex C of this test standard. The PCTR shall include conformance log and detailed test results whenever possible.

Test reports about additional tests shall contain a description of the test and the constituents.

4 Back office interface conformity declaration

The EETS Provider shall deliver a conformity declaration for the back office interface defined in [EP_IF]. The declaration shall contain a Protocol Implementation Conformance Statement (PICS) according to the requirements in [EP_IF].

5 Suitability for Use tests

5.1 General test requirements

The Suitability for Use test shall be performed by ASFINAG in cooperation with the EETS Provider. ASFINAG is entitled to appoint and authorize a company / organization (e.g. the supplier of the RSE) to carry out some or all tests. The EETS Provider may appoint and authorize a test institute or a Notified Body or suppliers to accompany the test. For OBU models which were already tested successfully with identical hard- / software version and a similar / identical configuration in the past e.g. for other EPEP, it can be agreed to drop selected functional OBE tests according to chapter 5.2 and 5.3. The remaining tests to be carried out are on disposal of ASFINAG.

All test results shall be fully documented in a test report, containing identification of the tested OBE, test set-up, test equipment, test vectors and test results – ensuring traceability and allowing reproducibility.

Test Contracts:

For the functional OBE tests according to chapter 5.2 and 5.3 the used EFC Context Mark shall differ from the one used later on (E2E test in production environment, pilot and operational phase).

Note 1: The numbering of the test cases in the following sections is in accordance with the historic and original ASFINAG test definitions. A lot of the original test cases are not applicable for the EETS "Suitability for Use" tests and therefore not present. The test cases are grouped in a new order.

Test report constituents:

The list below defines the information that shall be delivered as a report for each test case:

- test name
- test number
- run number and total number of test runs

- hardware version of tested EETS OBE
- software version of tested EETS OBE
- test location, versions and/or identification of used RSE test equipment
- description of test run (if appropriate including special observations)
- test result description (including test passed/not passed)
- test date and test duration (e.g. start and end time)
- name of the responsible tester
- reference to test log files or supplementary test documentation if available

5.2 Functional OBE tests

All tests shall be performed at least with an OBE contingent from pilot-run series, which are manufactured on mass production conditions. The sample size shall be sufficient to proof the corresponding requirement and acceptance criteria. At least ten samples of the OBE subject to testing shall be provided by the EP for tests in test environment, each personalized as agreed between EP and ASFINAG (For personalization data example see ch. 7). For tests in production environment add. 10 samples are required (personalization data to be agreed). If the EPEP can assure change of personalization data remotely at short notice, a minimum number of five samples could be agreed.

Precondition for starting the functional OBE tests is the accepted conformity declaration for this OBE.

As test equipment the roadside equipment currently in use in the Austrian tolling system needs to be used if not defined and agreed differently.

5.2.1 Objectives

The main objectives of the functional OBE tests are:

- Verification of the OBE functionality in interaction with beacons under laboratory conditions (including the verification of the user MMI).
- Validation of the transaction reliability of the OBE.
- Guarantee the OBE functionality in interaction with the road side equipment in a sufficiently large communication zone.

- Verification of the ASFINAG MMI requirements for the OBE.
- Verification of the OBE interaction with the road side and enforcement equipment.
- Verification of the EETS OBE functionality together with a reference OBE being at the same time in the RSE communication zone.

5.2.2 Laboratory test cases

All test cases in this chapter are performed under laboratory conditions.

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|---------------------|---|--------------------------|
| <i>Test name:</i> | Basic transaction – stand-alone beacon | <i>No.:</i> 1.0.5 |
| <i>Purpose:</i> | Verification of the OBE personalization and functionality in interaction with road side equipment | |
| <i>Equipment:</i> | Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope | |
| <i>Description:</i> | <p>Several transactions shall be performed with OBEs with different personalization data (detailed test data specification see Annex A – OBE personalization data):</p> <ul style="list-style-type: none"> – Vehicle category (e.g. 2, 3 or 4+ axles) and license plate numbers – European vehicle class (e.g. HGV up to and over 12t, large passenger vehicles) – Expiry date after current date <p>To evaluate the test target, a second transaction is performed with each OBE to read-out the attribute ReceiptData1 written in the previous transaction.</p> <p>Checking of the acoustic signal of the OBE; checking of the toll transaction record.</p> <p>The test case steps are to be executed with samples of the OBE under test with all the different OBE personalization data configurations under test.</p> <p>The test case is to be executed with all available beacon types and all relevant applications.</p> <p>At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.</p> | |
| <i>Intention:</i> | <p>Performing of valid transactions: Depending on the values presented by the OBE the tariff can be correctly calculated.</p> <p>The received data is according to the defined personalization data of the OBE.</p> <p>The value of Receiptdata1 written by the RSE is correctly stored and can be correctly read-out.</p> <p>Check the MMI beep signaling for "transaction OK".</p> | |

| | | |
|-------------------|---------------------------------------|-------------------|
| Test name: | Transaction – expiry date near | No.: 1.1.3 |
|-------------------|---------------------------------------|-------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope

Description: Tolling transaction of an OBE with an expiry date that is reached in less than two months: The data element PaymentMeans.ExpiryDate has a date value which will be reached in less than 62 days.

Checking of the acoustic signal of the OBE; checking of the toll transaction record.

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: Signaling of near expiry date by the OBE (OBE expires within 62 days) with two beeps.

Correct OBE data presented by the OBE and collected in the toll transaction record.

| | | |
|-------------------|---------------------------------------|-------------------|
| Test name: | Transaction – contract expired | No.: 1.1.5 |
|-------------------|---------------------------------------|-------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope

Description: Tolling transaction of an expired OBE: The data element PaymentMeans-ExpiryDate is older than the current date.

Checking of the acoustic signal of the OBE; checking of the toll transaction record.

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: Correct signaling of the expired contract by the OBE with four beeps.

Correct OBE data presented by the OBE and collected in the toll transaction record.

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|-------------------|--|-------------------|
| Test name: | Transaction – static conditions | No.: 1.2.1 |
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| <i>Purpose:</i> | Verification of the OBE functionality in interaction with road side equipment. |
| <i>Equipment:</i> | Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope |
| <i>Description:</i> | <p>Put an OBE in communication area of an RSE with fixed BeaconID for more than 5 minutes.</p> <p>Remove the OBE from the communication area of the beacon with fixed BeaconID and keep it out of the communication area of the beacon for more than 5 minutes.</p> <p>Put the OBE back into the communication area of the beacon with fixed BeaconID (no BeaconID change is to be done before this).</p> <p>Checking of the acoustic signal of the OBE; checking of the toll transaction record.</p> <p>The test case is to be executed with all available beacon types and all relevant applications.</p> |
| <i>Intention:</i> | <p>Correct behavior of the OBE being in the communication zone of at least 5 minutes: Only one transaction is performed. Correct OBE data presented by the OBE and collected in the toll transaction record.</p> <p>Correct behavior of the OBE after being removed from the communication zone for 5 minutes and placed back into the communication zone after that: One transaction is performed. Correct OBE data presented by the OBE and collected in the toll transaction record.</p> |

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| <i>Test name:</i> | Tariff correlation and MMI axles selection (in the lab) | <i>No.:</i> 1.2.5 |
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|---------------------|---|
| <i>Purpose:</i> | Verification of the OBE functionality in interaction with the user and the road side equipment. |
| <i>Equipment:</i> | Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope |
| <i>Description:</i> | <p>Transactions are performed by OBE with different tariff parameters:</p> <ul style="list-style-type: none"> – Base vehicle category: 2, 3 or 4+ Axles – For base vehicle category 2 and 3 the transaction is performed before and after a change of the axle selection (to all possible categories 3 and 4+) via the MMI. – European vehicle class (e.g. HGV up to and over 12t, large passenger vehicles) <p>Observation of the toll transaction records in the database.</p> <p>Check the OBE axle category or axles number MMI indication of the base category and/or after the setting by MMI.</p> |

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: Performing of valid transactions with the correct tariff (depends on vehicle category and contract type). Every transaction is performed with the correct tariff according to the active tariff table:

- By base category
- After change of the axles by MMI

Checking the indication of the current axles category and/or number.

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|-------------------|---|--------------------------|
| <i>Test name:</i> | System stability – broken transactions | <i>No.:</i> 1.2.6 |
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Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope

Description: 15 OBEs including at least 10 samples of the OBE under test are put into the communication zone at the same time, until all have signaled a completed transaction.

All samples of the OBE under test are valid (not expired, not blacklisted, ...).

Observation of the toll transaction records in the RSE Database.

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: For each OBE one valid transaction is present in the RSE Database: a total of 15 valid transactions with status “transaction completed” is present in the database

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| <i>Test name:</i> | Allocation of new DSRC master-keys | <i>No.:</i> 1.2.7 |
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Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope

Description: Substitution of the DSRC access credentials master-keys on MAS-side for a wrong key: Keys are changed manually.

No performing of valid transactions when RSE and OBE use different keys: Access denied by the OBE.

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: No performing of valid transactions when RSE and OBE use different keys:
Access denied by the OBE.

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|-------------------|------------------------|--------------------------|
| <i>Test name:</i> | OBE blacklisted | <i>No.:</i> 1.2.8 |
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Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope

Description: The OBE ID of the OBE is put on the Blacklist of the RSE; the OBE is brought into the communication area.

Checking of the acoustic signal of the OBE; checking of the toll transaction record.

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: The OBE signals a non-valid transaction with four beeps.
Correct OBE data presented by the OBE and collected in the toll transaction record.

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|-------------------|-------------------------------|---------------------------|
| <i>Test name:</i> | OBE with blacklist bit | <i>No.:</i> 1.2.8A |
|-------------------|-------------------------------|---------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope

Description: OBE with Bit 15 in EquipmentStatus set for blacklisting; the OBE is brought into the communication area.

Checking of the acoustic signal of the OBE; checking of the toll transaction record.

The test case is to be executed with all available beacon types and all relevant applications.

At least five executions of the test cases steps per available beacon type and relevant application are to be performed in scope of this test case.

Intention: The OBE signals a non-valid transaction with four beeps.
Correct OBE data presented by the OBE and collected in the toll transaction record.

| | | |
|-------------------|-----------------------------------|--------------------------|
| <i>Test name:</i> | Transaction - timing tests | <i>No.:</i> 1.3.1 |
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Purpose: Verification of the correct OBE timing according to EN12253 and EN12795 in interaction with the beacon.

Equipment: Lab equipment, test beacon.

Description: The parameters U1, U1a, U8, U8a, U13, U13a from EN 12253 and T3, T4a, T4b, T5, N3 from EN 12795 are determined by appropriate test setups. The random selection of the public uplink window is checked.

Intention: Checking the correct timing according to EN12253 and EN12795.

| | | |
|-------------------|---|--------------------------|
| <i>Test name:</i> | Transaction – software stability (Conveyor Belt Arrangement) | <i>No.:</i> 1.2.3 |
|-------------------|---|--------------------------|

Purpose: Verification of the stability of the OBE functionality in interaction with RSE by moving through the communication zone.

Equipment: Conveyor belt arrangement equipped with Multi-lane beacon of each multi-lane beacon type deployed in the system with the relevant application (EN15509) according to the test scope in an anechoic chamber.
The beacon is having its beacon ID changed automatically for each passage or a second beacon is used without interfering communication zone to simulate BeaconID change.

Description: An OBE shall perform more than 10.000 transactions by moving through the communication zone.

The OBE movement through the communication zone with a Conveyor belt arrangement is used based on following behavior:

- Dynamic RF path loss and phase changes normally arising during the passage of a tolling station are simulated by movement of the OBE under test on a conveyor belt.
- **For this test case, the communication zone shall exhibit strong fading effects.**
- By adjusting the simulated driving speed, the communication duration shall be set to a value in a range between 180 milliseconds and half a second (500 milliseconds) for each transaction.

The test shall be performed separately with at least 3 samples of the OBE under test.

The test case is to be executed with each multi-lane beacon type deployed in the system and all relevant applications

Intention: Testing of stability of OBE software.

Expected result:

- Less than 0,05% missing or incorrect transactions for each OBE.
- No multiple transactions performed within one passage.

A correct transaction is defined as a transaction delivering enough data for correct tolling to the RSE data base.

Remark: This test case is mutually exclusive with test case 1.2.3A, where a DSRC Channel Simulator is used instead of the conveyor belt arrangement. This test case version is used, where it's possible to rotate the OBE under test on the conveyor belt.

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| <i>Test name:</i> | Transaction – software stability (DSRC Channel Simulator) | <i>No.:</i> 1.2.3A |
|-------------------|--|---------------------------|

Purpose: Verification of the stability of the OBE functionality in interaction with RSE by moving through a simulated communication zone in an anechoic chamber.

Equipment: Dynamic DSRC Channel Simulator equipped with Multi-lane beacon of each multi-lane beacon type deployed in the system with the relevant application (EN15509) according to the test scope. The beacon is changing the beacon ID automatically for each simulated passage.

Description: An OBE shall perform more than 10.000 transactions by moving through the simulated communication zone.

The simulation of the OBE movement through the communication zone with a "DSRC Channel Simulator" is used based on following behavior:

- Dynamic RF path loss and phase changes normally arising during the passage of a tolling station are simulated in an anechoic chamber using a DSRC Channel Simulator.
- For this test case, the simulated communication zone shall exhibit strong fading effects.
- By adjusting the simulated driving speed, the communication duration shall be set to a value in a range between 180 milliseconds and half a second (500 milliseconds) for each transaction.

The test shall be performed separately with at least 3 samples of the OBE under test.

The test case is to be executed with each multi-lane beacon type deployed in the system and all relevant applications.

Intention: Testing of stability of OBE software.

Expected result:

- Less than 0,05% missing or incorrect transactions for each OBE.
- No multiple transactions performed within one passage.

A correct transaction is defined as a transaction delivering enough data for correct tolling to the RSE data base.

Remark: This test case is mutually exclusive with test case 1.2.3, where a conveyor belt arrangement is used instead of the DSRC Channel Simulator. This test case version is only used, where it's not possible to rotate the OBE under test on the conveyor belt (e.g. due to size/ weight or external power supply of the OBU).

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| <i>Test name:</i> | Transaction - behavior at slow motion (Conveyor Belt Arrangement) | <i>No.:</i> 1.4.1 |
|-------------------|--|--------------------------|

Purpose: Verification of the OBE functionality in interaction with the beacon in case of slow entry into the communication zone.

Equipment: Conveyor belt arrangement equipped with Multi-lane beacon of each multi-lane beacon type deployed in the system with the relevant application (EN15509) according to the test scope in an anechoic chamber.
The beacon is having its beacon ID changed automatically for each passage or a second beacon is used without interfering communication zone to simulate BeaconId change.

Description: OBE is entering and leaving the communication zone slowly (simulated speed equal or lower 6 km/h).

- a) First test run: 300 times; if all transactions OK: passed.
- b) If at first test run there are missing or incomplete transactions: new test run with 1000 cycles.
If error rate < 0.3%: Test case is passed.

In the simulated communication scenario the OBE shall be located in the communication zone at least 6 seconds.

The test case is to be executed with each multi-lane beacon types deployed in the system and all relevant applications

The test shall be performed separately with at least 3 samples of the OBE under test.

Intention: Testing of stability of OBE software at slow motion

Expected result:

- Transaction error rate shall be less than 0.3%.for each OBE.

- No multiple transactions performed within one passage.

A correct transaction is defined as a transaction delivering enough data for correct tolling to the RSE data base.

Remark: This test case is mutually exclusive with test case 1.4.1A, where a DSRC Channel Simulator is used instead of the conveyor belt arrangement. This test case version is used, where it's possible to rotate the OBE under test on the conveyor belt.

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| <i>Test name:</i> | Transaction - behavior at slow motion (DSRC Channel Simulator) | <i>No.:</i> 1.4.1A |
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Purpose: Verification of the OBE functionality in interaction with the beacon in case of slow entry into the communication zone.

Equipment: Dynamic DSRC Channel Simulator equipped with Stand-alone beacons of all beacon types deployed in the system with the relevant application (EN15509) according to the test scope. The beacon is changing the beacon ID automatically for each simulated passage.

Description: OBE is entering and leaving the simulated communication zone slowly (simulated speed equal or lower 6 km/h).
The simulation of the OBE movement through the communication zone with a "DSRC Channel Simulator" is used based on following behavior::

- Dynamic RF path loss and phase changes normally arising during the passage of a tolling station are simulated using a "DSRC Channel Simulator"
- For this test case, the maximum downlink impact power to the OBU shall be set to a level of 6 dB above the OBU's sensitivity.
- Test execution:
 - a) First test run: 300 times; if all transactions OK: Test is passed.
 - b) If at first test run there are missing or incomplete transactions: new test run with 1000 cycles.

If error rate < 0.3%: Test is passed.

In the simulated communication scenario the OBE shall be located in the communication zone at least 6 seconds.

The test case is to be executed with each multi-lane beacon types deployed in the system and all relevant applications

The test shall be performed separately with at least 3 samples of the OBE under test.

- Intention:* Testing of stability of OBE software at slow motion
Expected result:
- Transaction error rate shall be less than 0.3%.for each OBE.
 - No multiple transactions performed within one passage.
- A correct transaction is defined as a transaction delivering enough data for correct tolling to the RSE data base
- Remark:* This test case is mutually exclusive with test case 1.4.1, where a conveyor belt arrangement is used instead of the DSRC Channel Simulator. This test case version is only used, where it's not possible to rotate the OBE under test on the conveyor belt (e.g. due to size/ weight or external power supply of the OBU).

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| <i>Test name:</i> | Transaction - behavior with OBE under test and reference OBE (Conveyor Belt Arrangement) | <i>No.:</i> 1.4.2 |
|-------------------|---|--------------------------|

Purpose: Verification of the OBE functionality in interaction with the beacon in a configuration where multiple OBE moving through the communication zone.

Equipment: Multi-lane beacon of each multi-lane beacon type deployed in the system with beacon controller and relevant application (EN15509) according to the test scope in an anechoic chamber.

The beacon is having its beacon ID changed automatically for each passage or a second beacon is used without interfering communication zone to simulate BeaconId change.

Description: Two samples of the OBE under test and one additional reference OBE are passing the communication zone consecutively (the contract of one sample of the OBE under test is blocked).

The OBE movement through the communication zone with a Conveyor belt arrangement is used based on following behavior:

- The OBEs distance to each other is 3 cm.
- The width of the communication zone is > 30 cm.
- The belt speed is set to 10 cm/s.
- In the simulated communication scenario the possible transaction duration shall be configured to a time longer than three (3) but less than five (5) seconds.

Test execution:

- c) First test run: 300 times; if all transactions OK: Test is passed.
- d) If at first test run there are missing or incomplete transactions: new test run with 1000 cycles.
If error rate < 0.3%: Test is passed.

The test case is to be executed with each multi-lane beacon type deployed in the system and all relevant applications

Intention: Transaction error rate shall be less than 0.3%.

Remark: This test case is only applied, where it's possible to rotate the OBE under test on the conveyor belt.

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|-------------------|---|---------------------------|
| <i>Test name:</i> | OBE MMI – Selection of Number of Axles by User | <i>No.:</i> 14.0.1 |
|-------------------|---|---------------------------|

Purpose: Verification of the OBE functionality in interaction with the user.

Equipment: Multi-lane beacon (RSE equivalent) deployed in the system with the relevant application (EN15509) according to the test scope. OBE operating manual provided by the EPEP.

Description: OBE personalized for a **truck** with 2 tractor axles and no trailer axles (Base category 2)

OBE MMI shall indicate 2 axles, check of category read by RSE shall show 2 axles.

Manual declaration of 1 trailer axle (done according to the operating manual)

OBE MMI shall indicate 3 axles, check of category read by RSE shall show 3 axles.

Manual declaration of 2 trailer axles (done according to the operating manual)

OBE MMI shall indicate 4 axles, check of category read by RSE shall show 4 axles.

If possible by MMI, increase number of trailer axles further

OBE MMI shall indicate more than 4 axles, check of category read by RSE shall show still 4 axles.

Set again declaration of trailer axles to 1(done according to the operating manual)

OBE MMI shall indicate 3 axles, check of category read by RSE shall show 3 axles.

Set again declaration of trailer axles to 0 (done according to the operating manual)

OBE MMI shall indicate 2 axles, check of category read by RSE shall show 2 axles.

Upon each change of the declared trailer axles the category shall be confirmed by performing a transaction on a toll station equipment and checking the toll record of the transaction.

OBE personalized for a **bus** (European Vehicle Group 3) with 2 tractor axles and no trailer axles (Base category 2)

Repeat the test steps above, in contrast to a truck the manually declared trailer axles shall not be reflected in the transaction record of RSE.

Intention: The OBE's MMI shall allow to declare trailer axles until the sum of (number of tractor axles (=base class) + number of declared trailer axles) =4 (or higher if possible according to the OBEs operating manual) is reached.

Remark: For busses trailers are not taken into account during tariff calculation in the Austrian toll domain.

5.2.3 Test cases performed at the test site

The test site offers realistic testing conditions without traffic.

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| <i>Test name:</i> | Communication zone – Multilane Beacon, one beacon activated | <i>No.:</i> 3.0.1 |
|-------------------|--|--------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Multi-lane beacon of each multi-lane beacon type deployed in the system with beacon controller with echo software.

Determination of the communication zone with only one beacon activated.

Description: The antenna lobe of this beacon exhibits 30° vertically and 45° azimuthally opening. The main beam is tilted by 45° to the horizontal direction and points against the direction of the lane. The beacon is mounted at a height of 5.5m to 6.5m. The transmit power level is adjusted to 33 dBm EIRP as specified by EN 300674. The RX sensitivity is better than –104 dBm (-110 dBm typically).

The communication zone is determined with the ECHO application.

The following configuration shall be used:

- Echo size: 124+4 Byte
- Number of Echoes: 100

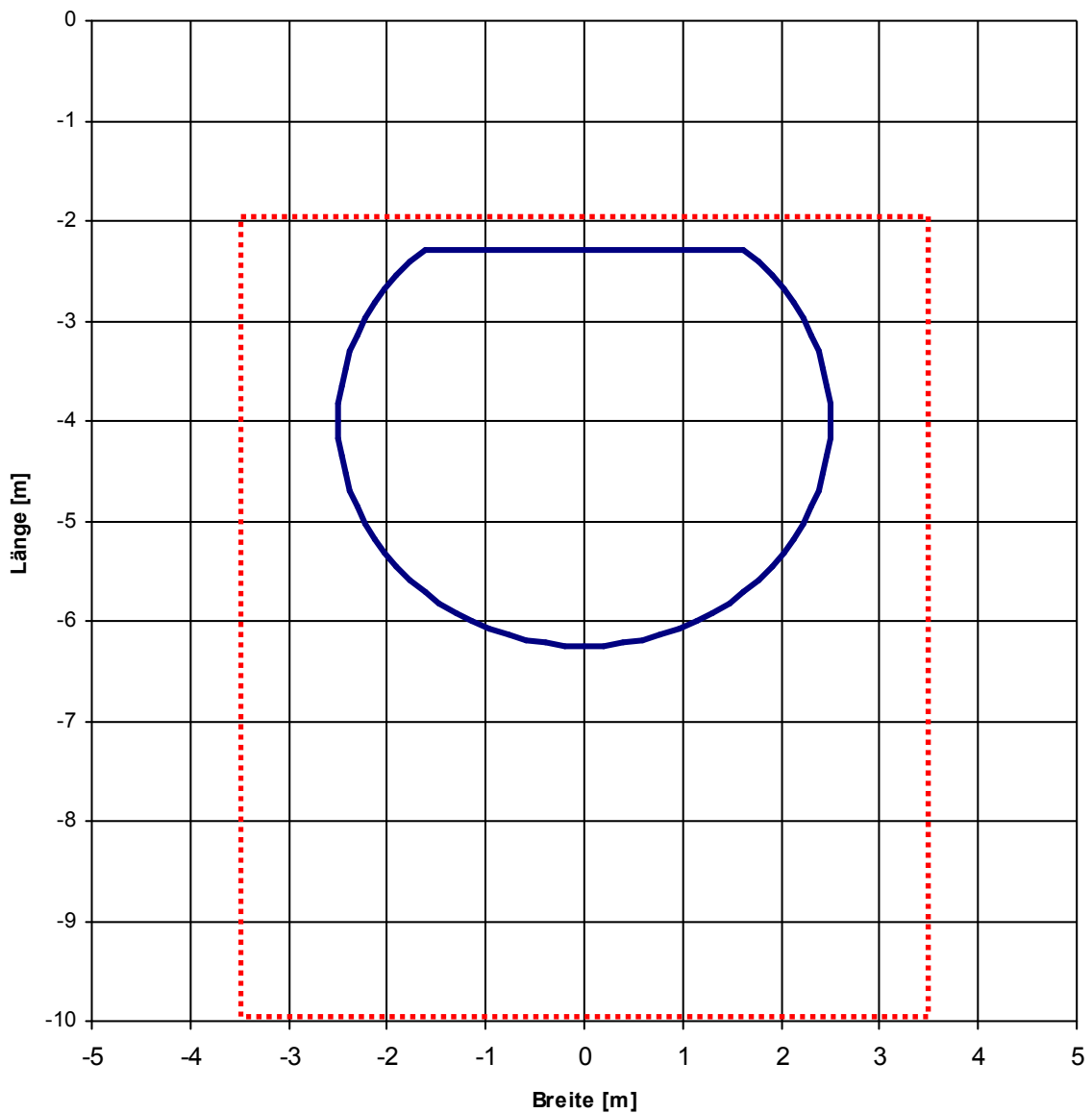
The OBE has to be properly mounted at a height of 2.2m behind laminated glass equivalent to the windscreen of a truck, which is orientated perpendicular to the street surface and perpendicular to the direction of the lane.

The test case shall be executed with each multi-lane beacon type deployed in the system.

Intention: At the lateral position of the beacon the communication zone of the OBE under test shall have a minimum length of 4 m and a width of +/- 2.5 m as shown by the blue line in the figure. The red dotted line shows the maximum allowed size of the communication zone.

The minimum communication zone is defined as the area where the OBE under test answers correctly more than 95% of all ECHO requests. Outside the maximum communication zone boundaries no OBE communication is allowed.

If the OBE is communicating outside the defined maximum communication zone, depending on the influence of this effect to the system performance, it can be agreed between ASFINAG and the RSE-system supplier to accept this OBE for operating in the Austrian system, provided that the OBE is compliant to all relevant standards.



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| <i>Test name:</i> | Communication zone – Multilane configuration, all beacons activated | <i>No.:</i> 3.0.2 |
|-------------------|--|--------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: At least 3 multi-lane beacons of each multi-lane beacon type deployed in the system with beacon controller with echo software.

Determination of the communication zone with at least three beacons mounted above 3 adjoining lanes activated.

Description: The antenna lobes of these beacons exhibit 30° vertically and 45° azimuthally opening. The main beams are tilted by 45° to the horizontal direction and point against the direction of the lane. The beacons are mounted at a height of 5.5m to 6.5m at a mutual distance of 2m to 3m perpendicular to the direction of the street. Each beacon uses a different RF

channel with a transmit power level of 33 dBm EIRP as specified by EN 300674. The RX sensitivity of each beacon is better than 104 dBm (-110 dBm typically).

The communication zone is determined with the ECHO application.

The following configuration has to be used:

- Echo size: 124+4 Byte
- Number of Echoes: 100

The OBE under test has to be properly mounted at a height of 2.2 m behind laminated glass equivalent to the wind screen of a truck which is orientated perpendicular to the street surface and perpendicular to the direction of the lane.

The test case shall be executed with each multi-lane beacon type deployed in the system.

Intention: For all tested lanes the communication zone of the OBE under test shall have a minimum length of 4 m.

The communication zone is defined as the area where the tested OBE answers correctly more than 95% of all ECHO requests.

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|-------------------|--|--------------------------|
| <i>Test name:</i> | Communication zone – single lane beacon | <i>No.:</i> 3.1.1 |
|-------------------|--|--------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment.

Equipment: Single-lane beacon with narrow footprint suitable for use in toll booths of each single-lane beacon type deployed in the system with echo application. Determination of the communication zone with one single-lane beacon activated.

Description: The antenna lobe of this beacon exhibits 15° vertically and 35° azimuthally opening. The main beam is tilted by 45° to the horizontal direction and points against the direction of the lane. The beacon is mounted at a height of 5.5m to 6.5m. The transmit power level is adjusted to 33 dBm EIRP as specified by EN 300674. The RX sensitivity is better than –104 dBm (-110 dBm typically).

The communication zone is determined with the ECHO application.

The following configuration has to be used:

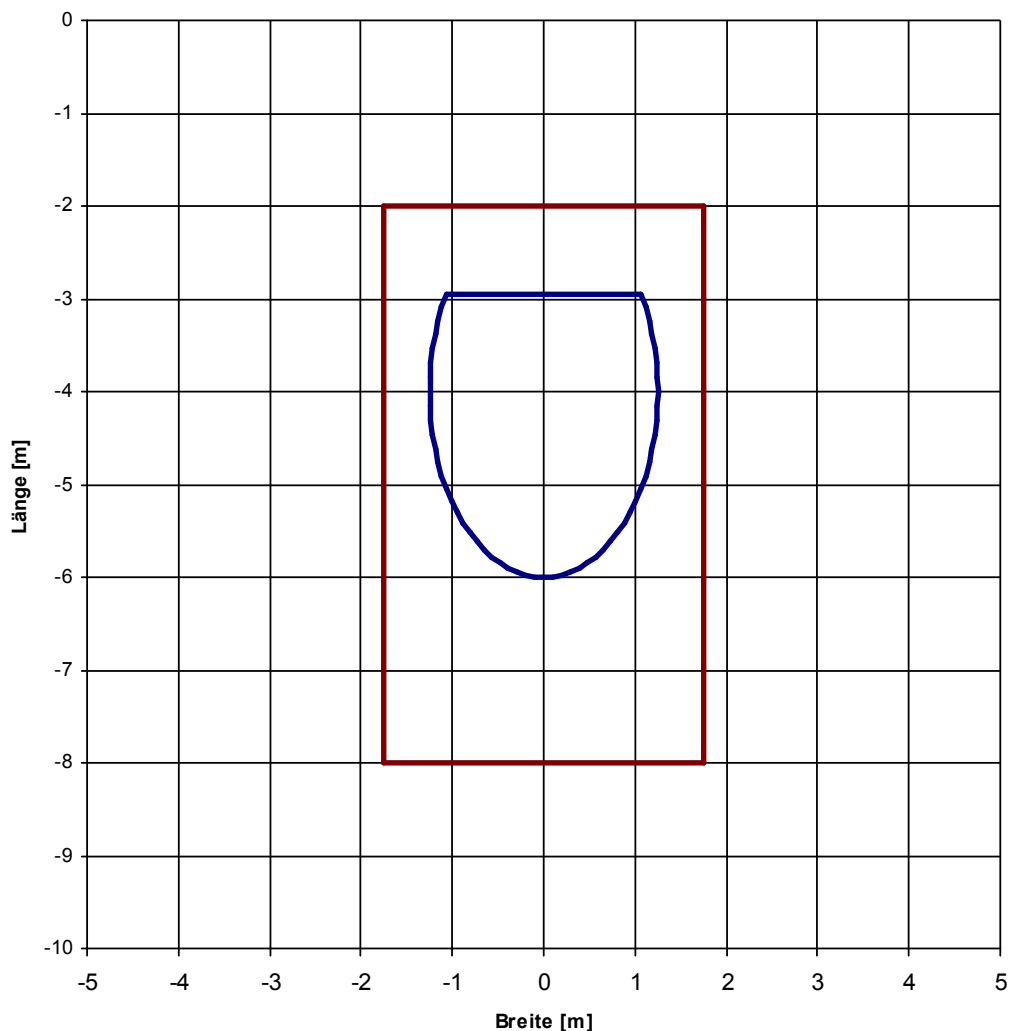
- Echo size: 124+4 Byte
- Number of Echoes: 100

The OBE has to be properly mounted at a height of 2.2m behind laminated glass equivalent to the wind screen of a truck which is orientated perpendicular to the street surface and perpendicular to the direction of the lane.

The test case is to be executed with each single-lane beacon type deployed in the system.

Intention: At the lateral position of the beacon the communication zone of the OBE under test shall have a minimum length of 3 m and a width of 1.25 m as shown by the blue (inner) line in the figure. The red (outer) rectangle shows the maximum allowed size of the communication zone.

The communication zone is defined as the area where the OBE under test answers correctly more than 95% of all ECHO requests.



5.3 OBE system compatibility tests

5.3.1 Objectives and overview

The main objective of the system compatibility test is to verify the functionality of the OBE in interaction with the road side and enforcement equipment, and to verify the correct processing within the tolling and enforcement system under operating conditions. After performing the transactions, the further processing of the transaction data in all the following systems will be checked.

The second objective is the verification of the OBE under test functionality together with a reference OBE being at the same time in the RSE communication zone.

The system compatibility test is divided into two phases. The first tests are performed at the test site. After passing these tests, additional tests on-road will check the system compatibility of the OBE under test under real operating conditions.

5.3.2 Test cases performed at the test site

The test site offers realistic testing conditions without traffic.

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| <i>Test name:</i> | OBE in dynamic conditions | <i>No.:</i> 2.0.1 |
| <i>Purpose:</i> | Verification of the OBE functionality in interaction with road side equipment under dynamic conditions. | |
| <i>Equipment:</i> | Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck). | |
| <i>Description:</i> | <p>Samples of the OBE under test with valid contract (not expired, not blacklisted, etc.).</p> <p>Passages are performed with the OBE at 50 km/h and 80 km/h.</p> <p>Check of the toll transactions and enforcement data e.g. at the data base of RSE.</p> <p>At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.</p> | |
| <i>Intention:</i> | Correct matching of the toll transaction record with the enforcement data record: For the OBE one valid transaction is created and no enforcement data is created. | |

(A check of the raw enforcement data shall confirm that the vehicle was effectively detected by enforcement equipment and that the Enforcement record was matched with the Toll Transaction record.)

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| <i>Test name:</i> | EETS OBE and GO-Box in the communication area | <i>No.:</i> 2.0.3 |
|-------------------|--|--------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment under dynamic conditions in combination with a reference OBE (GO-Box) in the same vehicle.)

Equipment: Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck).

Description: A sample of the EETS OBE under test and a sample GO-Box in the same vehicle.

Either the sample of the EETS OBE under test or the sample GO-Box are expired (PaymentMeans-ExpiryDate older than current date).

The other one is valid (not expired, not blacklisted, account not low in case of Pre-Pay-GO-Box, ...).

Passage is performed with both the EETS OBE and the GO-Box mounted in the vehicle at 80 km/h.

Check of the toll transaction and enforcement data.

At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: Both EETS OBE and GO-Box perform a transaction

- Expired OBE: transaction is not valid
- Valid OBE: transaction is valid

No enforcement data is created.

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| <i>Test name:</i> | Multi EETS OBE in dynamic conditions | <i>No.:</i> 2.0.7 |
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Purpose: Verification of the OBE functionality in a multi OBE situation in interaction with road side equipment under dynamic conditions.

Equipment: Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck).

Description: Passing the communication zone with three valid EETS OBE in one vehicle at the same time: passage with 3 EETS OBE mounted in the vehicle at 80km/h.

Checking of the acoustic signal of the OBE; observation of the toll transaction database at the RSE.

At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: Each OBE should perform one valid toll transaction: the OBE signals the transaction and a toll transaction record is created.

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| <i>Test name:</i> | EETS OBE in dynamic conditions – Expiry date near | <i>No.:</i> 2.0.10 |
|-------------------|--|---------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment under dynamic conditions.

Equipment: Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck).

Description: Passing the communication zone with nearly expired OBE under test (PaymentMeans.ExpiryDate not expired, but expiring within 62 days) mounted in the vehicle.

Passage is performed at 80 km/h.

Checking of the acoustic signal of the OBE; observation of the toll transaction database at the RSE.

At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: The OBE under test signals that the expiry date is near (2 beep). A valid toll transaction record is created. No Enforcement data is created.

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|-------------------|--|---------------------------|
| <i>Test name:</i> | EETS OBE in dynamic conditions – contract expired | <i>No.:</i> 2.0.12 |
|-------------------|--|---------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment under dynamic conditions.

Equipment: Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck).

Description: Passing the communication zone with expired OBE under test (PaymentMeans.ExpiryDate expired, i.e. older than current date) mounted in the vehicle.

Passage is performed at 80 km/h.

Checking of the acoustic signal of the OBE; observation of the toll transaction database and enforcement data at the RSE.

At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: The OBE under test signals that the contract is expired (4 beep). A not valid toll transaction record is created in the database. Enforcement data with appropriate enforcement type is generated.

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| <i>Test name:</i> | EETS OBE in dynamic conditions – OBE on blacklist | <i>No.:</i> 2.0.17 |
| <i>Purpose:</i> | Verification of the OBE functionality in interaction with road side equipment under dynamic conditions. | |
| <i>Equipment:</i> | Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck). | |
| <i>Description:</i> | <p>Passing the communication zone with blacklisted OBE under test (the OBE-ID of the OBE under test is put to the Blacklist of the RSE) mounted in the vehicle.</p> <p>Passage is performed at 80 km/h.</p> <p>Checking of the acoustic signal of the OBE; observation of the toll transaction and enforcement data at the RSE.</p> <p>At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.</p> | |
| <i>Intention:</i> | The OBE under test signals that it is blacklisted (4 beep). A not valid toll transaction record is created. Enforcement data with appropriate enforcement type is generated | |

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| <i>Test name:</i> | EETS OBE in dynamic conditions – Wrong category declared | <i>No.:</i> 2.1.2 |
| <i>Purpose:</i> | Verification of the OBE functionality in interaction with road side equipment under dynamic conditions. | |
| <i>Equipment:</i> | Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck). | |
| <i>Description:</i> | <p>Passing the communication zone with valid OBE under test mounted in the vehicle at 80km/h.</p> <p>The value of the declared vehicle category (2, 3 or 4+ axles) or the number of axles of the trailer (1 or 2+ axles) in the OBE under test is lower than the category (number of axles) of the truck</p> <p>Checking of the acoustic signal of the OBE; observation of the toll transaction database and enforcement data at the RSE.</p> <p>At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.</p> | |
| <i>Intention:</i> | The OBE under test signals a correct transaction (1 beep). A valid toll transaction is created in the database. Generation of enforcement transaction data (OBU with wrong declaration of vehicle category) with appropriate enforcement type. | |

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| <i>Test name:</i> | EETS OBE in dynamic conditions – Wrong license plate number | <i>No.:</i> 2.1.3 |
|-------------------|--|--------------------------|

Purpose: Verification of the OBE functionality in interaction with road side equipment under dynamic conditions.

Equipment: Fixed roadside enforcement equipment (Enforcement station) and vehicle (truck).

Description: Passing the communication zone with valid OBE under test mounted in the vehicle at 80km/h.

The OBU is personalized with a license plate number different in at least 2 characters from the trucks license plate.

Checking of the acoustic signal of the OBE; observation of the toll transaction database and enforcement data at the RSE.

At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: The OBE under test signals a correct transaction (1 beep). A valid toll transaction is created in the database. Generation of enforcement transaction data (OBE with wrong LPN) with appropriate enforcement type.

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| <i>Test name:</i> | EETS OBE and Portable Enforcement Equipment – Wrong category declared | <i>No.:</i> 13.0.2 |
|-------------------|--|---------------------------|

Purpose: Verification of the OBE functionality in interaction with portable enforcement equipment.

Equipment: Tolling station, upgraded with portable enforcement equipment , truck with trailer

Description: Passage with the EETS OBE mounted in the vehicle at 80 km/h.

The value of the declared vehicle category (2, 3 or 4+ axles) or the number of axles of the trailer (1 or 2+ axles) in the OBE is lower than the real axle category of truck + trailer.

Checking of the acoustic signal of the OBE; checking of the toll transaction and enforcement data at the RSE.

At least six passages are to be performed in scope of this test case.

Intention: The OBE signals a correct transaction (1 beep). A valid toll transaction record is created in the database. Correct functionality of the toll station and portable enforcement equipment in interaction with the OBE. Generation of enforcement transaction data (OBU with wrong declaration of vehicle category) with appropriate enforcement type.

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|-------------------|---|---------------------------|
| <i>Test name:</i> | EETS OBE and Portable Enforcement Equipment – OBE on blacklist | <i>No.:</i> 13.0.3 |
|-------------------|---|---------------------------|

Purpose: Verification of the OBE functionality in interaction with portable enforcement equipment.

Equipment: Tolling station, upgraded with portable enforcement equipment , truck with trailer

Description: Passing the communication zone with blacklisted OBE under test (the OBE-ID of the OBE under test is put to the Blacklist of the RSE) mounted in the vehicle.
 Passage is performed at 80 km/h.
 Checking of the acoustic signal of the OBE; observation of the toll transaction and enforcement data at the RSE.
 At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: The OBE under test signals that it is blacklisted (4 beep). A not valid toll transaction record is created. Enforcement data with appropriate enforcement type is generated

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| <i>Test name:</i> | EETS OBE and Portable Enforcement Equipment – OBE with blacklist bit set | <i>No.:</i> 13.0.3 A |
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Purpose: Verification of the OBE functionality in interaction with portable enforcement equipment.

Equipment: Tolling station, upgraded with portable enforcement equipment , truck with trailer

Description: Passing the communication zone with OBE under test (Bit 15 in EquipmentStatus is set for blacklisting purposes) mounted in the vehicle.
 Passage is performed at 80 km/h.
 Checking of the acoustic signal of the OBE; observation of the toll transaction data and enforcement data at the RSE.
 At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: The OBE under test signals that it is blacklisted (4 beep). A not valid toll transaction record is created. Enforcement data with appropriate enforcement type is generated

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| <i>Test name:</i> | EETS OBE and Portable Enforcement Equipment – valid OBE | <i>No.:</i> 13.0.4 |
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Purpose: Verification of the OBE functionality in interaction with portable enforcement equipment.

Equipment: Tolling station, upgraded with portable enforcement equipment , truck with trailer

Description: Passing the communication zone with OBE under test (Valid contract, not expired, not blacklisted etc.) mounted in the vehicle.
 Passage is performed at 80 km/h.
 Checking of the acoustic signal of the OBE; observation of the toll transaction data and enforcement data at the RSE.
 At least six passages respectively executions of the test cases steps are to be performed in scope of this test case.

Intention: The OBE under test signals a valid transaction (1 beep).

Correct matching of the toll transaction with the enforcement data:
 For the OBE one valid transaction is created and no enforcement data is created.
 (The presence of the vehicle’s enforcement data in the raw enforcement data confirms that the vehicle was effectively detected and that the Enforcement record was matched with the Toll Transaction record.)

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| <i>Test name:</i> | EETS OBE MKE readout | <i>No.:</i> 9.0.1 |
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Purpose: Verification of the OBE functionality in interaction with mobile enforcement equipment.

Equipment: Mobile enforcement equipment, truck

Description: Various EETS OBE with different OBE data (declared category, base axles class, license Plate Number, contract type) and different status: account low, contract expired, OBE on Blacklist, OBE on Incident List, etc.
 All EETS OBE should have performed tolling transactions before read-out with mobile enforcement equipment.
 Read-out of the EETS OBE in stock-still truck by a passing the mobile enforcement equipment with a speed of 20 km/h.
 Checking of the MKE functionality: simple read-out, displaying on mobile enforcement equipment GUI of OBE data (only the EETS data is available)

Intention: Correct readout and signaling of the OBE. Correct displaying of OBE data and status on mobile enforcement equipment.

5.3.3 On-road test cases

The on-road tests are containing all system compatibility tests not executable at the test site.

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|---------------------|---|---------------------------|
| <i>Test name:</i> | Tariff correlation and MMI axles selection (on the road) | <i>No.:</i> 1.2.5A |
| <i>Purpose:</i> | Verification of the OBE functionality in interaction with the user and the road side equipment under dynamic conditions. | |
| <i>Equipment:</i> | Heavy-goods vehicles, tolling stations, enforcement stations, toll booth equipment, tolling stations upgraded with portable tolling stations | |
| <i>Description:</i> | <p>Transactions are performed by OBE with different tariff parameters:</p> <ul style="list-style-type: none"> – Base vehicle category: 2, 3 or 4+ Axles – For base vehicle category 2 and 3 the transaction is performed before and after a change of the axle selection (to all possible categories 3 and 4+) via the MMI. – European vehicle class (e.g. HGV up to and over 12t, large passenger vehicles) <p>Observation of the toll transaction records in the database.</p> <p>Check the OBE axle category or axles number MMI indication of the base category and/or after the setting by MMI.</p> | |
| <i>Intention:</i> | <p>Performing of valid transactions with the correct tariff (depends on vehicle category and contract type). Every transaction is performed with the correct tariff according to the active tariff table:</p> <ul style="list-style-type: none"> – By base category – After change of the axles by MMI <p>Checking the indication of the current axles category and/or number.</p> | |

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| <i>Test name:</i> | EETS OBE on-road tolling | <i>No.:</i> 4.0.1 |
| <i>Purpose:</i> | Verification of the functionality of OBE in interaction with the road side equipment under dynamic conditions. | |
| <i>Equipment:</i> | Heavy-goods vehicles, tolling stations, enforcement stations, toll booth equipment, tolling stations upgraded with portable tolling stations | |
| <i>Description:</i> | <p>The test shall be performed with several (approximately 5) OBE with valid contracts at all station types on the road (live system).</p> <p>The Test covers multiple passages of:</p> <ul style="list-style-type: none"> - tolling stations - enforcement stations - toll booth equipment | |

- tolling stations upgraded with portable tolling stations

Intention: Performing of valid transactions and no enforcement.
For each passage of any station type with each of the OBEs under test a valid toll transaction is performed and signaled by the OBE.

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|-------------------|-------------------------------------|--------------------------|
| <i>Test name:</i> | EETS OBE on-road enforcement | <i>No.:</i> 5.0.1 |
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Purpose: Verification of the OBE functionality in interaction with road side equipment under dynamic conditions.

Equipment: Heavy-goods vehicle, enforcement stations

Description: The test shall be performed with an OBE with incorrect (too low) number of axles (OBE valid, i.e. not expired, not blacklisted,...) at all enforcement station types on the road.

Intention: Performing of enforcement transactions and check of their correct further handling.

For each passage of an enforcement station with the OBE under test:

- The OBE signals a valid transaction (1 beep).
- A valid toll transaction record is created in the database.
- An enforcement transaction record with appropriate enforcement type is created in the database.

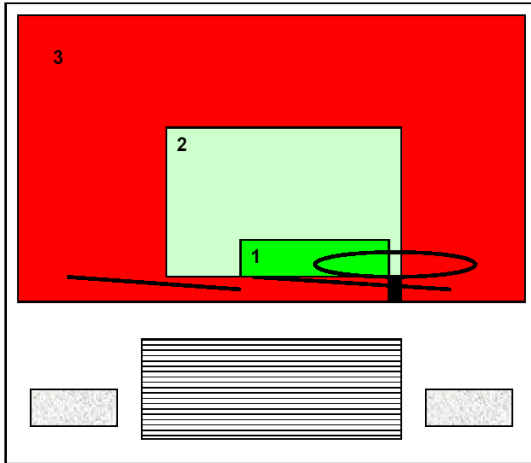
| | | |
|-------------------|---|---------------------------|
| <i>Test name:</i> | EETS OBE cross reading in toll booth environment | <i>No.:</i> 12.1.1 |
|-------------------|---|---------------------------|

Purpose: Verification of the OBE functionality in interaction with toll booth equipment.

Equipment: Toll booth equipment , truck

Description: Checking if the OBE communicates

- correctly with the beacon of the currently used lane
- not with beacons of other lanes



OBE is mounted behind windscreen on the outermost position (right or left hand side) of area 2.

Test mounting place of the OBE:

- area 1: optimal position
- area 2: suboptimal position
- area 3: wrong position

Intention: Correct transaction with the beacon of the currently used lane and correct signaling of the OBE. Correct displaying of OBE data on the tolling cash desk of the currently used lane.

5.4 Back office interface compatibility tests

5.4.1 Objectives and overview

The objective of the back office interface compatibility tests is the approval of an error free data exchange between the two back office implementations.

The test shall be performed in a non-operational test environment but with the data connections lines later used for operation. In this test environment, no data exchange shall have any influence on the real operational system, neither on the EETS Provider's nor on the ASFINAG system.

Precondition for starting the back office interface compatibility tests is the accepted conformity declaration for this interface.

5.4.2 Tests

The test processing is described in [EASYGO-206], the detailed information of the test scope of the back office interfaces is described in [EP_IF].

The relevant test stages as outlined in [EASYGO-206] with respect to the back office interface compatibility tests are:

- Integration Test 1 (INT1)
- Integration Test 2 (INT2)

5.4.2.1 Test scopes of the relevant test stages

The columns Interface and Step in the following table reference to the corresponding information in [EP_IF].

| Interface | Step | Description | INT1 | INT2 | E2E-TEST | E2E-PROD |
|-----------|------|---|------|------|----------|----------|
| ACT | 1 | Generate "local" output data | | | | |
| ACT | 2 | Receive and validate input data | | | | |
| ACT | 3 | Generate confirmation file | n.a. | n.a. | n.a. | n.a. |
| ACT | 4 | Download and validate confirmation file | n.a. | n.a. | n.a. | n.a. |
| ACT | 5 | Update tables | | | | |
| ACT | 6 | Generate output file | | | | |
| ACT | 7 | Download and validate own data in received file | | | | |

| | | | | | | |
|-----|----|---|------|------|------|------|
| ACT | 8 | Download and validate received file | | | | |
| ACT | 9 | Process received file | | | | |
| ACT | 10 | Validate processes | | | | |
| AIT | 1 | Generate “local” output data | | | | |
| AIT | 2 | Receive and validate input data | | | | |
| AIT | 3 | Generate confirmation data | n.a. | n.a. | n.a. | n.a. |
| AIT | 4 | Download and validate confirmation file | n.a. | n.a. | n.a. | n.a. |
| AIT | 5 | Update tables | | | | |
| AIT | 6 | Generate output file | | | | |
| AIT | 7 | Download and validate own data in received file | | | | |
| AIT | 8 | Download and validate received file | | | | |
| AIT | 9 | Process received file | | | | |
| AIT | 10 | Validate processes | | | | |
| TST | 1 | Generate “local” output data | | | | |
| TST | 2 | Receive and validate input data | | | | |
| TST | 3 | Generate confirmation data | n.a. | n.a. | n.a. | n.a. |
| TST | 4 | Download and validate confirmation file | n.a. | n.a. | n.a. | n.a. |
| TST | 5 | Update tables | | | | |
| TST | 6 | Generate output file | | | | |
| TST | 7 | Download and validate own data in received file | | | | |
| TST | 8 | Download and validate received file | | | | |
| TST | 9 | Process received file | | | | |
| TST | 10 | Validate processes | | | | |
| NAT | 1 | Generate “local” output data | | | | |
| NAT | 2 | Receive and validate input data | | | | |
| NAT | 3 | Generate confirmation file | | | | |
| NAT | 4 | Download and validate confirmation file | | | | |
| NAT | 5 | Update tables | | | | |
| NAT | 6 | Generate output file | | | | |
| NAT | 7 | Download and validate own data in received file | n.a. | n.a. | n.a. | n.a. |
| NAT | 8 | Download and validate received file | | | | |
| NAT | 9 | Process received file | | | | |
| NAT | 10 | Validate processes | | | | |
| HGV | 1 | Generate “local” output data | | | | |
| HGV | 2 | Receive and validate input data | | | | |
| HGV | 3 | Generate confirmation file | | | | |
| HGV | 4 | Download and validate confirmation file | | | | |
| HGV | 5 | Update tables | | | | |
| HGV | 6 | Generate output file | | | | |
| HGV | 7 | Download and validate own data in received file | n.a. | n.a. | n.a. | n.a. |
| HGV | 8 | Download and validate received file | | | | |
| HGV | 9 | Process received file | | | | |

| | | | | | | |
|-----|----|---|------|------|------|------|
| HGV | 10 | Validate processes | | | | |
| TIF | 1 | Generate output data | | | | |
| TIF | 2 | Receive and validate input data | | | | |
| TIF | 3 | Generate confirmation file | n.a. | n.a. | n.a. | n.a. |
| TIF | 4 | Download and validate confirmation file | n.a. | n.a. | n.a. | n.a. |
| TIF | 5 | Update tables | | | | |
| TIF | 6 | Generate output file | | | | |
| TIF | 7 | Download and validate own data in received file | n.a. | n.a. | n.a. | n.a. |
| TIF | 8 | Download and validate received file | | | | |
| TIF | 9 | Process received file | | | | |
| TIF | 10 | Validate processes | n.a. | n.a. | n.a. | n.a. |
| TIC | 1 | Generate output data | | | | |
| TIC | 2 | Receive and validate input data | | | | |
| TIC | 3 | Generate confirmation file | n.a. | n.a. | n.a. | n.a. |
| TIC | 4 | Download and validate confirmation file | n.a. | n.a. | n.a. | n.a. |
| TIC | 5 | Update tables | | | | |
| TIC | 6 | Generate output file | | | | |
| TIC | 7 | Download and validate own data in received file | n.a. | n.a. | n.a. | n.a. |
| TIC | 8 | Download and validate received file | | | | |
| TIC | 9 | Process received file | | | | |
| TIC | 10 | Validate processes | | | | |

5.4.2.2 Test-Scenarios regarding exchange of toll transaction data

The following Test-Scenarios regarding the exchange of toll transaction data (via TIF and TIC interfaces) files between TC and EPEP are tested in scope of test stage INT2:

Full acceptance of debit TIF file holding passages with valid transactions

(TIF Sample #01 - C1 Full Acceptance):

- For 2 OBE test samples from the HGV list of the EPEP at least 5 C1 records for each of the OBE test samples along with the respective E1 summary records are sent to the EPEP within a debit TIF file.
For 1 of the 2 OBE test samples a number of axles higher than the base category set in the HGV is used.
- The EPEP responds to this TIF file with a TIC file with a full acceptance.

Full acceptance of credit TIF file

(TIF Sample #02 - R2 Full Acceptance):

- Precondition: TIF Sample #01 has been successfully executed.

- For that OBE of TIF Sample #01, for which the number of axles higher than the base category has been used during TIF Sample #01 execution, the debit records that have been accepted by the EPEP in scope of TIF Sample #01 are credited and sent to the EPEP as R2 records along with the respective T1 summary record within a credit TIF file.
- The EPEP responds to this TIF file with a TIC file with a full acceptance.

Full acceptance of re-credit TIF file following a crediting

(TIF Sample #03 – C3 Full Acceptance following R2 Full Acceptance):

- Precondition: TIF Sample #02 has been successfully executed.
- For that OBE of TIF Sample #02, for which the transactions have been credited during TIF Sample #02 execution, the re-debiting is performed by sending C3 resent records with the number of axles and tariff according to the base category of the OBE in the EPEP's HGV along with the respective E1 summary record within a debit TIF file.
- The EPEP responds to this TIF file with a TIC file with a full acceptance.

Full acceptance of debit TIF file holding passages with reconstructed transactions

(TIF Sample #04 – C4 Full Acceptance):

- For 1 OBE test samples from the HGV list of the EP at least 5 C1 records and in-between 2 C4 records (representing gaps of toll stations on which no transaction took place) along with the respective E1 summary record are sent to the EP within a debit TIF file.
- The EP responds to this TIF file with a TIC file with a full acceptance.
- On the next working day a respective matching quality of service C8 records (non-clearable) to one of the clearable C4 records along with the respective quality of service E1 summary record are sent to the EP within a debit TIF file. As those are non-clearable, they are sent with a zero tariff amount.
- The EP responds to this TIF file with a TIC file with a full acceptance.

Full acceptance of debit TIF file holding passages with incomplete transactions

(TIF Sample #05 – C6 Full Acceptance):

- For 1 OBE test samples from the HGV list of the EP at least 5 C1 records and in-between 2 clearable C6 records (representing clearable incomplete transactions on toll stations) along with the respective E1 summary record are sent to the EP within a debit TIF file.

- The EP responds to this TIF file with a TIC file with a full acceptance.
- On the next working day a respective matching quality of service C8 records (non-clearable) to one of the clearable C6 records along with the respective quality of service E1 summary record are sent to the EP within a debit TIF file. As those are non-clearable, they are sent with a zero tariff amount.
- The EP responds to this TIF file with a TIC file with a full acceptance.

**Full acceptance of debit TIF file holding passages with video-based transactions
(TIF Sample #06 – C8 Full Acceptance):**

- For 1 OBE test samples from the HGV list of the EP at least 5 C1 records and in-between 2 clearable C8 records (representing video-based transactions on enforcement stations) along with the respective E1 summary record are sent to the EP within a debit TIF file.
- The EP responds to this TIF file with a TIC file with a full acceptance.
- On the next working day the respective matching quality of service C8 records (non-clearable) to the 2 clearable C8 records and 1 more quality of service C8 record (from a different station) along with the respective quality of service E1 summary record are sent to the EP within a debit TIF file. As those are non-clearable, they are sent with a zero tariff amount.
- The EP responds to this TIF file with a TIC file with a full acceptance.

**Partial rejection of debit TIF file holding passages with valid transactions
(TIF Sample #07 - C1 Partial Rejection):**

- For 2 OBE test samples from the HGV list of the EP at least 5 C1 records for each of the OBE test samples along with the respective E1 summary records are sent to the EP within a debit TIF file.
For 1 of the 2 OBE test samples the E1 summary record is manipulated to deviate from the sum of the C1 records tariff amounts to provoke a partial rejection.
- The EP responds to this TIF file with a TIC file with a partial rejection, rejection the C1 records and the E1 summary record of the OBE with the manipulated E1 summary record.

**Total rejection of debit TIF file holding passages with valid transactions
(TIF Sample #08 - C1 Total Rejection):**

- For 2 OBE test samples from the HGV list of the EP at least 5 C1 records for each of the OBE test samples along with the respective E1 summary records are sent to

the EP within a debit TIF file.

The footer of the TIF file is manipulated to deviate from the sum of the E1 summary records tariff amounts to provoke a total rejection.

- The EP responds to this TIF file with a TIC file with a total rejection.

Partial rejection of credit TIF file

(TIF Sample #09 – R2 Partial Rejection):

- Have TIF Sample #01 re-executed.
- For 1 OBE from the TIF Sample #01 re-execution perform a crediting similar to TIF Sample #2.

The T1 summary record of the credit TIF file is manipulated to deviate from the sum of the R2 records tariff amounts to provoke a partial rejection.

- The EP responds to this TIF file with a TIC file with a partial rejection, rejection the R2 records and the T1 summary record of the OBE with the manipulated E1 summary record.

Total rejection of credit TIF file

(TIF Sample #10 – R2 Total Rejection):

- Have TIF Sample #01 re-executed.
- For 1 OBE from the TIF Sample #01 re-execution perform a crediting similar to TIF Sample #2.

The footer of the credit TIF file is manipulated to deviate from the sum of the T1 summary records tariff amounts to provoke a total rejection.

- The EP responds to this TIF file with a TIC file with a total rejection.

Full acceptance of resent transactions in a TIF file without prior crediting

(TIF Sample #11 – C3 Full Acceptance without prior crediting):

- Precondition: TIF Sample #07 has been successfully executed.
- For that OBE of TIF Sample #07, for which the E1 summary record had been manipulated, C3 resent records (with the same axes and tariff like in the TIF Sample #07) along with the correct respective E1 summary record are sent within a debit TIF file.
- The EP responds to this TIF file with a TIC file with a full acceptance.

5.4.2.3 Test-Scenarios regarding check of the TST update handling

The following Test-Scenarios regarding the check of the TST update handling at the EP are tested in scope of test stage INT2:

Update of the TST having one toll station removed and a new one added (TST Update Sample #01):

- Precondition: The original TST of the TC has been processed before in the EP's back office system.
- Store the data of the actual TST of the TC to enable a seamless rollback later on.
- Remove 1 toll station from the TST.
- Add 1 toll station to the TST with an unused Station Code, Station Name Short and Station Name Long.
- Transmit the TST update to the EP.
- The EP processes the TST update in its back office system.

Check TST update by exchanging a debit TIF file

(TST Update Sample #02):

- Precondition: TST Update Sample #01 has been executed successfully.
- Send a debit TIF file to the EP with the following content:
 - o For 1 OBE test sample from the HGV list of the EP at least 5 C1 records, one of those representing a valid transaction at the toll station that has been added in TST Update Sample #01, along with the respective E1 summary record.
 - o For 1 other OBE test sample from the HGV list of the EP at least 5 C1 records, one of those representing a valid transaction at the toll station that has been removed in TST Update Sample #01, along with the respective E1 summary record.
- The EP responds to this TIF file with a TIC file with a partial rejection, accepting the records of the OBE that did a transaction at the toll station that has been added in TST Update Sample #01 and rejecting the records of the OBE that did a transaction at the toll station that has been removed in TST Update Sample #01.

Rollback of prior update of the TST

(TST Update Sample #03):

- Precondition: TST Update Sample #01 and TST Update Sample #02 have been executed successfully.

- Rollback the TST content to the content stored in TST Update Sample #01.
- Transmit the rolled back TST as a new update to the EP.
- The EP processes the new TST update in its back office system.

5.5 End to end tests

5.5.1 Objectives and overview

The end to end tests verify the full compatibility of the OBE and the EETS Providers back office interface within the whole tolling system and the coverage of all processes. After performing several test scenarios, the further processing of the transaction data in all the following systems will be checked.

Precondition for starting the end to end tests is successful functional OBE and back office interface compatibility tests.

A successful passing of the end to end tests is the precondition for the start of the pilot operation phase.

5.5.2 Test cases

The following E2E-Scenarios are performed in the testing environment during test stage E2E-TEST and in the operational EFC environment during test stage E2E-PROD. The following table gives an overview which of the E2E-Scenarios are tested in which of the test stages. Please note that for those E2E-Scenarios for which actual payment is involved, the payment relevant test cases are executed in E2E-PROD test stage only.

| E2E-Scenario-ID | E2E-Scenario-Title | E2E-TEST | E2E-PROD | E2E-PROD for new OBE of existing EP |
|-----------------|---|----------|----------|---|
| Scenario-01 | New EETS Contract with Service User | X | X | |
| Scenario-02 | OBE enters ASFINAG's toll domain for the first time while being blacklisted | X | X | |
| Scenario-03 | OBE performs transactions on the road - normal operation (incl. POS test) | X | X | |
| Scenario-04 | OBE performs transactions on the road - blacklisted OBE | X | X | X |
| Scenario-05 | OBE performs transactions on the road - OBE has blacklist bit set | | X | X |

| | | | | |
|-------------|---|---|---|---|
| Scenario-06 | OBE performs transactions on the road - enforcement | | X | |
| Scenario-07 | OBE performs transactions on the road - reconstructed transactions | X | X | X |
| Scenario-08 | OBE performs transactions on the road - incomplete transactions | X | | |
| Scenario-09 | OBE performs transactions on the road - crediting | X | X | |
| Scenario-10 | OBE performs transactions on the road - Service / Warning beep | | X | X |
| Scenario-11 | OBE performs transactions on the road - central retroactive payment | | X | |

5.5.2.1 E2E-Scenario-01: New EETS Contract with Service User

| | | | |
|-------------------|----------------------------|-------------|------------------|
| <i>Test name:</i> | Open a new contract | <i>No.:</i> | E2E-01.01 |
|-------------------|----------------------------|-------------|------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Service User (SU), Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: A Service User (SU) contacts a Toll Service Provider (EP) with a request to enter into a contract enabling the SU to drive with his vehicle in the toll domain of one or a number of specific Toll Chargers (TCs).

The EP collects the data needed from the SU for opening the requested contract.

The EP prepares the contract to be signed by the SU.

The SU signs the contract.

The EP collects the data regarding the vehicle for which the contract with the SU is to be established from the SU.

The EP personalizes the OBE with the previously collected data regarding the vehicle for which the contract with the SU is to be established and contractual data.

The EP produces the Vehicle Declaration holding all the needed information for the toll domains for which the SU has signed a contract.

Intention: EP agrees to establish a contract with the SU.

The SU's data needed for opening the contract is collected.

The contract is prepared and ready for signature by the SU.

The contract established.

The data of the vehicle of the SU is collected.

The OBE is personalized and ready for hand-over to the SU.

The Vehicle Declaration holding all the needed information for the toll domains for which the SU has signed a contract is prepared and ready for hand-over to the SU along with the OBE.

| | | |
|-------------------|---|-------------------------------|
| <i>Test name:</i> | Personal OBE handout - Distribute validation data - Update local HGV | <i>No.:</i> E2E-01.02a |
|-------------------|---|-------------------------------|

- Purpose:* Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.
- Actor:* Toll Service Provider (EP)
- Executed by:* Toll Service Provider (EP)
- Equipment:* Not applicable.
- Description:* The Toll Service Provider (EP) performs an update of his local Heavy Goods Vehicle data (HGV, whitelist) entering the OBE data of the OBE personalized for the Service User (SU) in Test Case E2E-01.01.
The EP sends the updated local HGV to the EasyGo HUB for distribution to the Toll Chargers (TCs).
The EP checks the EasyGo HUBs response to the local HGV data (HGC) to see whether the update of the local HGV data is successfully processed by the EasyGo HUB.
- Intention:* The EP's local HGV data is updated and ready for transmission to the EasyGo HUB.
The EP's update of the local HGV data is transmitted to the EasyGo HUB.
The HGC sent by the EasyGo HUB confirms that the local HGV data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

| | | |
|-------------------|--|-------------------------------|
| <i>Test name:</i> | Personal OBE handout - Distribute validation data - Process global HGV update | <i>No.:</i> E2E-01.03a |
|-------------------|--|-------------------------------|

- Purpose:* Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.
- Actor:* Toll Charger (TC)
- Executed by:* Toll Charger (TC)
- Equipment:* Not applicable.
- Description:* The Toll Charger (TC) downloads the updated global HGV from the EasyGo HUB.

The TC validates the updated global HGV after download.

The TC processes the updated global HGV within his back-office system.

Optional: The TC distributes the updated global HGV data to his road side equipment.

Intention: The updated global HGV is available at the TC.

The validation is successful.

The updated global HGV data is successfully imported into the TC's back-office system.

Optional: The updated global HGV data is distributed to the TC's road side equipment.

| | | |
|-------------------|--|-------------------------------|
| <i>Test name:</i> | Personal OBE handout - OBE and Vehicle Declaration handover | <i>No.:</i> E2E-01.04a |
|-------------------|--|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Toll Service Provider (EP), Service User (SU)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) personally (i.e. by means of a point-of-sale or the like) hands over the personalized OBE and the corresponding Vehicle Declaration (see Test Case E2E-01.01) to the Service User (SU).

Intention: The SU has received the personalized OBE and the corresponding Vehicle Declaration.

| | | |
|-------------------|--|-------------------------------|
| <i>Test name:</i> | Postal OBE delivery - Distribute validation data - Update local NAT | <i>No.:</i> E2E-01.02b |
|-------------------|--|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs an update of his local Non-Accepted Table data (NAT, blacklist) entering the OBE data of the OBE personalized for the Service User (SU) in Test Case E2E-01.01.

The EP sends the updated local NAT to the EasyGo HUB for distribution to the Toll Chargers (TCs).

The EP checks the EasyGo HUBs response to the local NAT data (NAC) to see whether the update of the local NAT data is successfully processed by the EasyGo HUB.

Intention: The EP's local NAT data is updated and ready for transmission to the EasyGo HUB.

The EP's update of the local NAT data is transmitted to the EasyGo HUB.

The NAC sent by the EasyGo HUB confirms that the local NAT data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

| | | |
|-------------------|---|-------------------------------|
| <i>Test name:</i> | Postal OBE delivery - Distribute validation data - Process global NAT update | <i>No.:</i> E2E-01.03b |
|-------------------|---|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) downloads the updated global NAT from the EasyGo HUB.

The TC validates the updated global NAT after download.

The TC processes the updated global NAT within his back-office system.

Optional: The TC distributes the updated global NAT data to his road side equipment.

Intention: The updated global NAT is available at the TC.

The validation is successful.

The updated global NAT data is successfully imported into the TC's back-office system.

Optional: The updated global NAT data is distributed to the TC's road side equipment.

| | | |
|-------------------|---|-------------------------------|
| <i>Test name:</i> | Postal OBE delivery - Send OBE and Vehicle Declaration to SU | <i>No.:</i> E2E-01.04b |
|-------------------|---|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) sends the personalized OBE and the corresponding Vehicle Declaration (see Test Case E2E-01.01) to the Service User (SU) by means of a postal or delivery service.
The OBE needs to be shielded when sent to the SU by means of a postal or delivery service.

Intention: The SU has received the personalized OBE and the corresponding Vehicle Declaration.

| | | |
|-------------------|--|-------------------------------|
| <i>Test name:</i> | Postal OBE delivery - SU activates the received OBE | <i>No.:</i> E2E-01.05b |
|-------------------|--|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) contacts his Toll Service Provider (EP) for activation of the personalized OBE received by means of a postal or delivery service.

Intention: The EP activates the OBE in his system.
The OBE is ready to be used on the road.

| | | |
|-------------------|--|-------------------------------|
| <i>Test name:</i> | Postal OBE delivery - Distribute validation data - Update local NAT and HGV | <i>No.:</i> E2E-01.06b |
|-------------------|--|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs an update of his local Non-Accepted table data (NAT, blacklist) removing the OBE data of the OBE personalized for the Service User (SU) in Test Case E2E-01.01.

The EP sends the updated local NAT to the EasyGo HUB for distribution to the Toll Chargers (TCs).

The EP checks the EasyGo HUBs response to the local NAT data (NAC) to see whether the update of the local NAT data is successfully processed by the EasyGo HUB.

The EP performs an update of his local Heavy Goods Vehicle data (HGV, whitelist) entering the OBE data of the OBE personalized for the Service User (SU) in Test Case E2E-01.01.

The EP sends the updated local HGV to the EasyGo HUB for distribution to the Toll Chargers (TCs).

The EP checks the EasyGo HUBs response to the local HGV data (HGC) to see whether the update of the local HGV data is successfully processed by the EasyGo HUB.

Intention: The EP's local NAT data is updated and ready for transmission to the EasyGo HUB.

The EP's update of the local NAT data is transmitted to the EasyGo HUB.

The NAC sent by the EasyGo HUB confirms that the local NAT data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

The EP's local HGV data is updated and ready for transmission to the EasyGo HUB.

The EP's update of the local HGV data is transmitted to the EasyGo HUB.

The HGC sent by the EasyGo HUB confirms that the local HGV data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

| | | |
|-------------------|---|-------------------------------|
| <i>Test name:</i> | Postal OBE delivery - Distribute validation data - Process global NAT and HGV update | <i>No.:</i> E2E-01.07b |
|-------------------|---|-------------------------------|

Purpose: Verification the Service User contract formation process of the EP and the subsequent exchange of the validation data.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) downloads the updated global NAT from the EasyGo HUB.

The TC validates the updated global NAT after download.

The TC processes the updated global NAT within his back-office system.

Optional: The TC distributes the updated global NAT data to his road side equipment.

The TC downloads the updated global HGV from the EasyGo HUB.

The TC validates the updated global HGV after download.

The TC processes the updated global HGV within his back-office system.

Optional: The TC distributes the updated global HGV data to his road side equipment.

Intention: The updated global NAT is available at the TC.

The validation is successful.

The updated global NAT data is successfully imported into the TC's back-office system.

Optional The updated global NAT data is distributed to the TC's road side equipment.

The updated global HGV is available at the TC.

The validation is successful.

The updated global HGV data is successfully imported into the TC's back-office system.

Optional The updated global HGV data is distributed to the TC's road side equipment.

5.5.2.2 E2E-Scenario-02: Blacklisted OBE first time in toll domain

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-02.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of new OBE that is blacklisted while entering the Austrian toll domain for the very first time.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) but his OBE is blacklisted (listed on the NAT file) when entering the Austrian toll domain for the first time.

The SU drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC until the OBE under tests signals it being blacklisted (4 beeps).

The OBE under test is not listed among the EP's entries of the global HGV file (OBE under test is not whitelisted).

The OBE under test is listed among the EP's entries of the global NAT file (OBE under test is blacklisted).

Intention: After 3 to 10 passages of toll stations the OBE signals an invalid transaction (4 beeps).

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-02.02 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of new OBE that is blacklisted while entering the Austrian toll domain for the very first time.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.

The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-02.01) were performed, will hold the first 3 to 10 transactions of the OBE under test until the TC's road side equipment got aware that the OBE is blacklisted.

Intention: The TIF files are correctly generated.

The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.

No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Reject billing details - generate TIC files | <i>No.:</i> E2E-02.03 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of new OBE that is blacklisted while entering the Austrian toll domain for the very first time.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) rejects the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.

The EP rejects the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-

Cases E2E-02.01) were performed as the OBE under test has been blacklisted at that time.

Intention: The TIF files are downloaded by the EP.
The TIC files are correctly generated.
The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP validates that no payment for service usage is claimed by TC | <i>No.:</i> E2E-02.04 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of new OBE that is blacklisted while entering the Austrian toll domain for the very first time.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates that no payment for service usage is claimed by the Toll Charger (TC) for the transactions performed by the OBE under test in scope of Test Case E2E-02.01.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) received from the TC does not hold the transactions performed by the OBE under test in scope of Test Case E2E-02.01.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC validates that no payment of issuer fee is claimed by EP | <i>No.:</i> E2E-02.05 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of new OBE that is blacklisted while entering the Austrian toll domain for the very first time.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates that no payment of issuer fee is claimed by the Toll Service Provider (EP) for the transactions performed by the OBE under test in scope of Test Case E2E-02.01.

Intention: The EP's claim for payment of issuer fee does not hold the transactions performed by the OBE under test in scope of Test Case E2E-02.01.

5.5.2.3 E2E-Scenario-03: OBE transactions - normal operation (incl. POS)

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-03.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Passages of toll stations - no transactions generated | <i>No.:</i> E2E-03.02 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test shielded to prevent generation of transactions while passing toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple passages of the TC's toll stations shall be done.

Intention: The OBE under test signals no transaction (no beep) on each of the passages of any kind of the TC's toll stations.

No transactions of the OBE under test are processed and stored in the TC's system in the timeframe in which the OBE under test was shielded.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Retroactive payment at POS - no transactions generated | <i>No.:</i> E2E-03.03 |
|-------------------|---|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) stops at a Toll Charger's (TC's) Point of Sale (POS) to do retroactive payment for passages of the TC's toll stations at which no valid transactions has been performed (see Test Case E2E-03.02).

Or a SU stops at a TC's POS to do retroactive payment for passages of the TC's toll stations at which a too low number of axles has been set at the OBE under test.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

Hint: In the Austrian toll domain such a retroactive payment is only possible possible as long as the passage of the toll station for which a retroactive payment is done is less than 100 km from the location of the POS and the passage of the toll station for which a retroactive payment is done was done less than 5 hours ago from the current date and time when doing the retroactive payment at the POS.

Intention: The retroactive payment based on the Vehicle Declaration is successfully done.

No transactions of the OBE under test corresponding to the toll stations for which the retroactive payment has been performed are processed and stored in the TC's system.

| | | |
|---------------------|---|------------------------------|
| Test name: | Report billing details - generate TIF files | No.: E2E-03.04 |
| Purpose: | Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain. | |
| Actor: | Toll Charger (TC) | |
| Executed by: | Toll Charger (TC) | |
| Equipment: | Not applicable. | |
| Description: | <p>The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.</p> <p>The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-03.01, E2E-03.02, E2E-03.04 and E2E-03.03a if relevant for the TC) were performed, will hold the following types of transactions of the OBE under test:</p> <ul style="list-style-type: none"> • C1 transactions | |
| Intention: | <p>The TIF files are correctly generated.</p> <p>The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.</p> | |

| | | |
|---------------------|---|------------------------------|
| Test name: | Acknowledge billing details - generate TIC files | No.: E2E-03.05 |
| Purpose: | Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain. | |
| Actor: | Toll Service Provider (EP) | |
| Executed by: | Toll Service Provider (EP) | |
| Equipment: | Not applicable. | |
| Description: | <p>The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.</p> <p>The EP acknowledges the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-03.01, E2E-03.02, E2E-03.04 and E2E-03.03a if relevant for the TC) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:</p> <ul style="list-style-type: none"> • C1 transactions | |
| Intention: | <p>The TIF files are downloaded by the EP.</p> <p>The TIC files are correctly generated.</p> | |

The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB. No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC claims payment for service usage from EP | <i>No.:</i> E2E-03.06 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).
The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-03.07 |
|-------------------|---|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files.
The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.

Intention: The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-03.08 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).

The EP generates and sends an invoice for the issuer fee to the TC.

Intention: The invoice for the issuer fee is sent to the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-03.09 |
|-------------------|---|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment for service usage from SU | <i>No.:</i> E2E-03.10 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment for service usage from the Service User (SU).

The EP generates and sends an invoice for service usage to the SU.

In the Agency model this invoice is in the name and on behalf of the TC.
 In the Reseller model this invoice is in the EP's own name.

Intention: The invoice for for service usage is sent to the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | SU performs payment for service usage to EP | <i>No.:</i> E2E-03.11 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) performs the payment for service usage to the Toll Service Provider (EP).

Intention: The invoice for service usage is payed by the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP performs payment for service usage to TC | <i>No.:</i> E2E-03.12 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs the payment for service usage to the Toll Charger (TC).

Intention: The invoice for service usage is payed by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC performs payment of issuer fee to EP | <i>No.:</i> E2E-03.13 |
|-------------------|--|------------------------------|

Purpose: Verification of the normal operation (valid transaction, retroactive payment at the point of sale) in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs the payment of the issuer fee to the Toll Service Provider (EP).

Intention: The invoice of the issuer fee is paid by the TC.

5.5.2.4 E2E-Scenario-04: OBE transactions – blacklisted OBE

| | | |
|-------------------|-------------------------------------|------------------------------|
| <i>Test name:</i> | EP moves OBE from HGV to NAT | <i>No.:</i> E2E-04.01 |
|-------------------|-------------------------------------|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) blacklists a Service User's (SU's) OBE which was whitelisted before for any reason. The OBE is removed from the TPS's HGV data (whitelist) and added to the EP's NAT data (blacklist).

The EP sends the updated local NAT and local HGV to the EasyGo HUB for distribution to the Toll Chargers (TCs).

The EP checks the EasyGo HUBs response to the local NAT data (NAC) and local HGV data (HGC) to see whether the update of the local NAT data and local HGV data is successfully processed by the EasyGo HUB.

Intention: The EP's local NAT data is updated and ready for transmission to the EasyGo HUB.

The EP's update of the local NAT data is transmitted to the EasyGo HUB.

The NAC sent by the EasyGo HUB confirms that the local NAT data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

The EP's local HGV data is updated and ready for transmission to the EasyGo HUB.

The EP's update of the local HGV data is transmitted to the EasyGo HUB.

The HGV sent by the EasyGo HUB confirms that the local HGV data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC processes global NAT and HGV update | <i>No.:</i> E2E-04.02 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) downloads the updated global NAT and global HGV from the EasyGo HUB.
 The TC validates the updated global NAT and global HGV after download.
 The TC processes the updated global NAT and global HGV within his back-office system.
 Optional: The TC distributes the updated global NAT and global HGV data to his road side equipment.

Intention: The updated global NAT is available at the TC.
 The validation is successful.
 The updated global NAT data is successfully imported into the TC's back-office system.
 Optional Step: The updated global NAT data is distributed to the TC's road side equipment.
 The updated global HGV is available at the TC.
 The validation is successful.
 The updated global HGV data is successfully imported into the TC's back-office system.
 Optional Step: The updated global HGV data is distributed to the TC's road side equipment.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Passages of toll stations - no valid transactions generated | <i>No.:</i> E2E-04.03 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test being blacklisted passing toll stations of the TC.
 The OBE under test is listed among the EP's entries of the global NAT file (OBE under test is blacklisted).

The OBE under test is not listed among the EP's entries of the global HGTV file (OBE under test is not whitelisted).

A couple passages of the TC's toll stations shall be done.

Intention: The OBE under test signals an invalid transaction (4 beeps) on each of the passages of any kind of the TC's toll stations.
Only invalid transactions of the OBE under test are processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-04.04 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.
The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-04.03) were performed, will not hold any transactions of the OBE under.

Intention: The TIF files are correctly generated.
The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Validate billing details - generate TIC files | <i>No.:</i> E2E-04.05 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the billing details to the Toll Charger (TC) checking that no transactions of the OBE under test are part of the received TIF file(s).

Intention: The TIF files are downloaded by the EP.

No transactions of the OBE under test were part of the received TIF file(s).
 The TIC files are correctly generated.
 The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
 No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP validates that no payment for service usage is claimed by TC | <i>No.:</i> E2E-04.06 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates that no payment for service usage is claimed by the Toll Charger (TC) for the any transactions performed by the OBE under test in scope of Test Case E2E-04.03.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) received from the TC does not hold the transactions performed by the OBE under test in scope of Test Case E2E-04.03.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC validates that no payment of issuer fee is claimed by EP | <i>No.:</i> E2E-04.07 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates that no payment of issuer fee is claimed by the Toll Service Provider (EP) for the transactions performed by the OBE under test in scope of Test Case E2E-04.03.

Intention: The EP's claim for payment of issuer fee does not hold the transactions performed by the OBE under test in scope of Test Case E2E-04.03.

| | | |
|-------------------|-------------------------------------|------------------------------|
| <i>Test name:</i> | EP moves OBE from HGV to NAT | <i>No.:</i> E2E-04.08 |
|-------------------|-------------------------------------|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) whitelists a Service User's (SU's) OBE that has been blacklisted before. The OBE is added to the TPS's HGV data (whitelist) and removed from the EP's NAT data (blacklist).
The EP sends the updated local NAT and local HGV to the EasyGo HUB for distribution to the Toll Chargers (TCs).
The EP checks the EasyGo HUBs response to the local NAT data (NAC) and local HGV data (HGC) to see whether the update of the local NAT data and local HGV data is successfully processed by the EasyGo HUB.

Intention: The EP's local NAT data is updated and ready for transmission to the EasyGo HUB.
The EP's update of the local NAT data is transmitted to the EasyGo HUB. The NAC sent by the EasyGo HUB confirms that the local NAT data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.
The EP's local HGV data is updated and ready for transmission to the EasyGo HUB.
The EP's update of the local HGV data is transmitted to the EasyGo HUB. The HGV sent by the EasyGo HUB confirms that the local HGV data is correctly processed without errors by the EasyGo HUB and will be distributed to the TCs with the next scheduled update.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC processes global NAT and HGV update | <i>No.:</i> E2E-04.09 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct behavior of blacklisting and blacklisted OBEs in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) downloads the updated global NAT and global HGV from the EasyGo HUB.
The TC validates the updated global NAT and global HGV after download.

The TC processes the updated global NAT and global HGV within his back-office system.

Optional: The TC distributes the updated global NAT and global HGV data to his road side equipment.

Intention: The updated global NAT is available at the TC.

The validation is successful.

The updated global NAT data is successfully imported into the TC's back-office system.

Optional Step: The updated global NAT data is distributed to the TC's road side equipment.

The updated global HGV is available at the TC.

The validation is successful.

The updated global HGV data is successfully imported into the TC's back-office system.

Optional Step: The updated global HGV data is distributed to the TC's road side equipment.

5.5.2.5 E2E-Scenario-05: OBE transactions – OBE has blacklist bit set

Remark: This E2E-Scenario is optional and only relevant in scope of tests if the Toll Service Provider (EP) uses the OBEs feature to set the blacklist bit on the OBE.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP sets blacklist bit of OBE under test | <i>No.:</i> E2E-05.01 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) sets the blacklist bit of a Service User's (SU's) OBE which is listed in the EP's HGV data (whitelisted) for any reason.

Intention: The OBE under test has its blacklist bit set.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Passages of toll stations - no valid transactions generated | <i>No.:</i> E2E-05.02 |
|-------------------|--|------------------------------|

| | |
|---------------------|---|
| <i>Purpose:</i> | Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain. |
| <i>Actor:</i> | Service User (SU) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test having its blacklist bit set passing toll stations of the TC.</p> <p>The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).</p> <p>A couple passages of the TC's toll stations shall be done.</p> |
| <i>Intention:</i> | <p>The OBE under test signals an invalid transaction (4 beeps) on each of the passages of any kind of the TC's toll stations.</p> <p>Only invalid transactions of the OBE under test are processed and stored in the TC's system.</p> |

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| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-05.03 |
|-------------------|--|------------------------------|

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|---------------------|---|
| <i>Purpose:</i> | Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain. |
| <i>Actor:</i> | Toll Charger (TC) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.</p> <p>The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-05.02) were performed, will not hold any transactions of the OBE under.</p> |
| <i>Intention:</i> | <p>The TIF files are correctly generated.</p> <p>The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.</p> |

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|-------------------|--|------------------------------|
| <i>Test name:</i> | Validate billing details - generate TIC files | <i>No.:</i> E2E-05.04 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the billing details to the Toll Charger (TC) checking that no transactions of the OBE under test are part of the received TIF file(s).

Intention: The TIF files are downloaded by the EP.
No transactions of the OBE under test were part of the received TIF file(s).
The TIC files are correctly generated.
The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | EP validates that no payment for service usage is claimed by TC | <i>No.:</i> E2E-05.05 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates that no payment for service usage is claimed by the Toll Charger (TC) for the any transactions performed by the OBE under test in scope of Test Case E2E-05.02.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) received from the TC does not hold the transactions performed by the OBE under test in scope of Test Case E2E-05.02.

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| <i>Test name:</i> | TC validates that no payment of issuer fee is claimed by EP | <i>No.:</i> E2E-05.06 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates that no payment of issuer fee is claimed by the Toll Service Provider (EP) for the transactions performed by the OBE under test in scope of Test Case E2E-05.02.

Intention: The EP's claim for payment of issuer fee does not hold the transactions performed by the OBE under test in scope of Test Case E2E-05.02.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | EP resets blacklist bit of OBE under test | <i>No.:</i> E2E-05.07 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct behavior of usage of blacklist bit of OBEs in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) resets a Service User's (SU's) OBE blacklist bit that has been set before.

Intention: The OBE under test has its blacklist bit reset.

5.5.2.6 E2E-Scenario-06: OBE transactions – enforcement

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| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-06.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of enforcement stations - no transactions generated | <i>No.:</i> E2E-06.02 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test shielded to prevent generation of transactions while passing enforcement stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple passages of the TC's enforcement stations shall be done.

Intention: The OBE under test signals no transaction (no beep) on each of the passages of any kind of the TC's enforcement stations.

No transactions of the OBE under test are processed and stored in the TC's system in the timeframe in which the OBE under test was shielded.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of enforcement stations - too low number of axles set | <i>No.:</i> E2E-06.03 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

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|---------------------|---|
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing enforcement stations of the TC.</p> <p>The number of axles set on the OBE under test is lower than the actual number of axles of the vehicle which is used for performing the test including any trailer.</p> <p>The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).</p> <p>The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).</p> <p>A couple passages of the TC's enforcement stations shall be done.</p> |
| <i>Intention:</i> | <p>The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.</p> <p>The transactions generated with the OBE under test are correctly processed and stored in the TC's system.</p> |

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|-------------------|--|-------------|-------------------|
| <i>Test name:</i> | Enforcement - central enforcement | <i>No.:</i> | E2E-06.04a |
|-------------------|--|-------------|-------------------|

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|---------------------|---|
| <i>Purpose:</i> | Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Toll Charger (TC) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Charger (TC) performs enforcement of the violation of the Service User (SU) by generating an enforcement case for the SU's violation of the tolling regulations in its enforcement center and submitting a violation ticket to the SU.</p> <p>A suspicion case for the SU's violation of the tolling regulations is generated by the TC's system and delivered to the enforcement center for inspection.</p> <p>The suspicion case delivered to the enforcement center for inspection is processed by the TC's employees in the enforcement center and acknowledge being an enforcement case.</p> <p>The TC contacts the SU's Toll Service Provider (EP) for the SU's contact information.</p> <p>The TC generates a violation ticket and sends it to the SU.</p> |

Intention: A new suspicion case for the SU's violation of the tolling regulations has been delivered to the enforcement center for inspection.

A new enforcement case for the SU's violation of the tolling regulations has been generated.

The EP provides the SU's contact information to the TC.

The SU receives the violation ticket sent to him by the TC.

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|-------------------|---|-------------|-------------------|
| <i>Test name:</i> | Enforcement - enforcement on the road (optional) | <i>No.:</i> | E2E-06.04b |
|-------------------|---|-------------|-------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs enforcement of the violation of the Service User (SU) on the road.

This is an optional Test Case!

It depends on the availability of a mobile enforcement unit of the TC in the vicinity of the SU's route within the toll domain of the TC.

The mobile enforcement unit of the TC gets notified that a SU violating tolling regulations is driving in its vicinity in the same direction like the mobile enforcement unit.

The mobile enforcement unit catches the SU that was found to be violating tolling regulations.

The mobile enforcement unit reads out the OBE under test of the SU that was found to be violating tolling regulations.

The mobile enforcement unit enforces the SU's violation of the tolling regulations.

Intention: The mobile enforcement unit is aware that there is a SU violating tolling regulations is driving in its vicinity in the same direction like the mobile enforcement unit.

The SU that was found to be violating tolling regulations is caught by the mobile enforcement unit.

The OBE data of the OBE under test is successfully read out.

The OBE data read out by the mobile enforcement unit matches the expected OBE data of the SU that was found to be violating tolling regulations.

The SU's violation of the tolling regulations is enforced.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-06.05 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.
The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-06.01, E2E-06.02 and E2E-06.03) were performed, will hold the following types of transactions of the OBE under test:

- C1 transactions
- Quality of Service C8 transactions (if Test Case E2E-06.04a has been executed before)

If the delivered TIF file does not hold Quality of Service C8 (video based) transactions for passages done in scope of Test Case E2E-06.02, those will be part of a TIF file delivered at the end of the day on which Test Case E2E-06.04a is executed.

The clearable C8 (video based) transactions for passages done in scope of Test Case E2E-06.02 will either be part of a TIF file holding the Quality of Service C8 (video based) transactions or of a TIF file one day later.

For the passages done in scope of Test Case E2E-06.03 only the tariff according to the claimed number of axles, not the one according to the actual number of axles, is stated in the TIF file!

Intention: The TIF files are correctly generated.
For the passages done in scope of Test Case E2E-06.03 only the tariff according to the claimed number of axles, not the one according to the actual number of axles, is stated in the TIF files.
The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB. No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | Acknowledge billing details - generate TIC files | <i>No.:</i> E2E-06.06 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.

Intention: The TIF files are downloaded by the EP.
The TIC files are correctly generated.
The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | TC claims payment for service usage from EP | <i>No.:</i> E2E-06.07 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).
The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-06.08 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files.

The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.

Intention: The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-06.09 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).

The EP generates and sends an invoice for the issuer fee to the TC.

Intention: The invoice for the issuer fee is sent to the TC.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-06.10 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment for service usage from SU | <i>No.:</i> E2E-06.11 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment for service usage from the Service User (SU).
The EP generates and sends an invoice for service usage to the SU.
In the Agency model this invoice is in the name and on behalf of the TC.
In the Reseller model this invoice is in the EP's own name.

Intention: The invoice for for service usage is sent to the SU.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | SU performs payment for service usage to EP | <i>No.:</i> E2E-06.12 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) performs the payment for service usage to the Toll Service Provider (EP).

Intention: The invoice for service usage is payed by the SU.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | EP performs payment for service usage to TC | <i>No.:</i> E2E-06.13 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs the payment for service usage to the Toll Charger (TC).

Intention: The invoice for service usage is payed by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC performs payment of issuer fee to EP | <i>No.:</i> E2E-06.14 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of enforcement processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs the payment of the issuer fee to the Toll Service Provider (EP).

Intention: The invoice of the issuer fee is paid by the TC.

5.5.2.7 E2E-Scenario-07: OBE transactions - reconstructed transactions

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| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-07.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C4 transactions | <i>No.:</i> E2E-07.02 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test shielded to prevent generation of transactions while passing toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

Only 1 to 2 subsequent passages of the TC's toll stations shall be done.

Intention: The OBE under test signals no transaction (no beep) on each of the passages of any kind of the TC's toll stations.

No transactions of the OBE under test are processed and stored in the TC's system in the timeframe in which the OBE under test was shielded.

For each of the passages of the toll stations passed with the OBE under test shielded in Test Step 1 a reconstructed transaction is generated, correctly processed and stored in the TC's system.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-07.03 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-07.04 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.

The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-07.01 to E2E-07.03) were performed, will hold the following types of transactions of the OBE under test:

- C1 transactions
- C4 transactions (depending on whether the TC's reconstruction mechanism has already reconstructed missing transactions)

The TIF file(s) generated by the TC usually at the next day after the day, on which the passages with the OBE under test (see Test-Cases E2E-07.01 to E2E-07.03) were performed, will hold the following types of transactions of the OBE under test:

- C4 transactions (for reconstructed missing transactions that have not been part of TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test were performed)

Intention: The TIF files are correctly generated.

The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.

No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Acknowledge billing details - generate TIC files | <i>No.:</i> E2E-07.05 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files. The EP acknowledges the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-07.01 to E2E-07.03) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:

- C1 transactions
- C4 transactions (depending on whether the TC's reconstruction mechanism has already reconstructed missing transactions)

The EP acknowledges the transactions of the TIF file(s) generated by the TC usually at the next day after the day, on which the passages with the OBE under test (see Test-Cases E2E-07.01 to E2E-07.03) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:

- C4 transactions (for reconstructed missing transactions that have not been part of TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test were performed)

Intention: The TIF files are downloaded by the EP.
The TIC files are correctly generated.
The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC claims payment for service usage from EP | <i>No.:</i> E2E-07.06 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

- Equipment:* Not applicable.
- Description:* The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).
The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.
- Intention:* The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-07.07 |
|-------------------|---|------------------------------|

- Purpose:* Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.
- Actor:* Toll Service Provider (EP)
- Executed by:* Toll Service Provider (EP)
- Equipment:* Not applicable.
- Description:* The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files.
The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.
- Intention:* The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-07.08 |
|-------------------|--|------------------------------|

- Purpose:* Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.
- Actor:* Toll Service Provider (EP)
- Executed by:* Toll Service Provider (EP)
- Equipment:* Not applicable.
- Description:* The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).
The EP generates and sends an invoice for the issuer fee to the TC.
- Intention:* The invoice for the issuer fee is sent to the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-07.09 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment for service usage from SU | <i>No.:</i> E2E-07.10 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment for service usage from the Service User (SU).

The EP generates and sends an invoice for service usage to the SU.

In the Agency model this invoice is in the name and on behalf of the TC.

In the Reseller model this invoice is in the EP's own name.

Intention: The invoice for for service usage is sent to the SU.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | SU performs payment for service usage to EP | <i>No.:</i> E2E-07.11 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) performs the payment for service usage to the Toll Service Provider (EP).

Intention: The invoice for service usage is paid by the SU.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | EP performs payment for service usage to TC | <i>No.:</i> E2E-07.12 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs the payment for service usage to the Toll Charger (TC).

Intention: The invoice for service usage is paid by the EP.

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|-------------------|--|------------------------------|
| <i>Test name:</i> | TC performs payment of issuer fee to EP | <i>No.:</i> E2E-07.13 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs the payment of the issuer fee to the Toll Service Provider (EP).

Intention: The invoice of the issuer fee is paid by the TC.

5.5.2.8 E2E-Scenario-08: OBE transactions - incomplete transactions

Remark: This E2E-Scenario is only performed in E2E-TEST as incomplete transactions are not predictable to be produced in the production environment.

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| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-08.01 |
|-------------------|---|------------------------------|

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| <i>Purpose:</i> | Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Service User (SU) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.</p> <p>The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).</p> <p>The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).</p> <p>A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).</p> |
| <i>Intention:</i> | <p>The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.</p> <p>The transactions generated with the OBE under test are correctly processed and stored in the TC's system.</p> |

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| <i>Test name:</i> | Passages of toll stations - generate C6 transactions | <i>No.:</i> E2E-08.02 |
|-------------------|---|------------------------------|

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| <i>Purpose:</i> | Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Service User (SU) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating incomplete transactions (C6) while passing all kinds of toll stations of the TC.</p> <p>The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).</p> |

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals no transaction (no beep) on each of the passages of any kind of the TC's toll stations.

Only incomplete transactions of the OBE under test are generated, correctly processed and stored in the TC's system in the timeframe in which incomplete transactions were generated.

For at least one of the passages of the toll stations passed with the OBE under test in the timeframe in which incomplete transactions were generated a restored incomplete transaction is generated, correctly processed and stored in the TC's system.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-08.03 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

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| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-08.04 |
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| <i>Purpose:</i> | Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Toll Charger (TC) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.</p> <p>The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-08.01 to E2E-08.03) were performed, will hold the following types of transactions of the OBE under test:</p> <ul style="list-style-type: none"> • C1 transactions • clearable C6 transactions (depending on whether the TC's reconstruction mechanism has already restored at least one of the incomplete transactions) • QoS C6 transactions (incomplete transactions that could not be restored by the TC's reconstruction mechanism) <p>The TIF file(s) generated by the TC usually at the next day after the day, on which the passages with the OBE under test (see Test-Cases E2E-08.01 to E2E-08.03) were performed, will hold the following types of transactions of the OBE under test:</p> <ul style="list-style-type: none"> • clearable C6 transactions (any further restored ones of the incomplete transactions) • QoS C6 transactions (incomplete transactions that could not be restored by the TC's reconstruction mechanism) |
| <i>Intention:</i> | <p>The TIF files are correctly generated.</p> <p>The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.</p> |

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| <i>Test name:</i> | Acknowledge billing details - generate TIC files | <i>No.:</i> E2E-08.05 |
|-------------------|---|------------------------------|

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|-----------------|---|
| <i>Purpose:</i> | Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Toll Service Provider (EP) |

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|---------------------|--|
| <i>Executed by:</i> | Toll Service Provider (EP) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.</p> <p>The EP acknowledges the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Cases E2E-08.01 to E2E-08.03) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:</p> <ul style="list-style-type: none"> • C1 transactions • clearable C6 transactions (depending on whether the TC's reconstruction mechanism has already restored at least one of the incomplete transactions) • QoS C6 transactions (incomplete transactions that could not be restored by the TC's reconstruction mechanism) <p>The EP acknowledges the transactions of the TIF file(s) generated by the TC usually at the next day after the day, on which the passages with the OBE under test (see Test-Cases E2E-08.01 to E2E-08.03) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:</p> <ul style="list-style-type: none"> • clearable C6 transactions (any further restored ones of the incomplete transactions) • QoS C6 transactions (incomplete transactions that could not be restored by the TC's reconstruction mechanism) |
| <i>Intention:</i> | <p>The TIF files are downloaded by the EP.</p> <p>The TIC files are correctly generated.</p> <p>The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.</p> |

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| <i>Test name:</i> | TC claims payment for service usage from EP | <i>No.:</i> E2E-08.06 |
|-------------------|--|------------------------------|

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|---------------------|---|
| <i>Purpose:</i> | Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Toll Charger (TC) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |

Description: The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).

The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-08.07 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files.
The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.

Intention: The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-08.08 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).

The EP generates and sends an invoice for the issuer fee to the TC.

Intention: The invoice for the issuer fee is sent to the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-08.09 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of incomplete transactions (reconstruction of broken transactions) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

5.5.2.9 E2E-Scenario-09: OBE transactions - crediting

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| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-09.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

The number of axles set on the OBE under test is higher than the actual number of axles that can be reached with the vehicle with which the test is performed.

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-09.02 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.

The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Case E2E-09.01) were performed, will hold the following types of transactions of the OBE under test:

- C1 transactions

Intention: The TIF files are correctly generated.

The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.

No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Acknowledge billing details - generate TIC files | <i>No.:</i> E2E-09.03 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.

The EP acknowledges the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Case E2E-09.01) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:

- C1 transactions

Intention: The TIF files are downloaded by the EP.
The TIC files are correctly generated.
The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

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|---------------------|---|------------------------------|
| <i>Test name:</i> | SU contacts EP with claim | <i>No.:</i> E2E-09.04 |
| <i>Purpose:</i> | Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain. | |
| <i>Actor:</i> | Service User (SU) | |
| <i>Executed by:</i> | Toll Charger (TC) | |
| <i>Equipment:</i> | Not applicable. | |
| <i>Description:</i> | <p>The Service User (SU) contacts the Toll Service Provider (EP) with a claim stating that the number of axles set on the OBE under test while driving in the Toll Charger's (TC's) toll domain was higher than the actual number of axles that can be reached with the vehicle with which the test was performed.</p> <p>The SU provides sufficient evidence to the EP that the set number of axles on the OBE under test was higher than the actual number of axles that can be reached with the vehicle with which the test was performed.</p> | |
| <i>Intention:</i> | <p>The EP receives the SU's claim and collects the evidence provided by the SU.</p> <p>The claim of the SU is found valid by the EP.</p> | |

| | | |
|---------------------|---|------------------------------|
| <i>Test name:</i> | EP requests credit note on behalf of SU | <i>No.:</i> E2E-09.05 |
| <i>Purpose:</i> | Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain. | |
| <i>Actor:</i> | Toll Service Provider (EP) | |
| <i>Executed by:</i> | Toll Service Provider (EP) | |
| <i>Equipment:</i> | Not applicable. | |

Description: The Toll Service Provider (EP) contacts the Toll Charger (TC) requesting a credit transaction in order to produce a credit note for the disputed billing details from the responsible TC.

The EP sends the evidence to support the reclamation to the TC.

Intention: The TC has received the reclamation, request for credit transaction and evidence from the EP.

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| <i>Test name:</i> | TC acknowledges requested credit | <i>No.:</i> E2E-09.06 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) processes the request for a credit note and acknowledges it based on the provided evidence.

Intention: The reclamation is acknowledged by the TC.

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|-------------------|---|------------------------------|
| <i>Test name:</i> | Report billing details credit - generate TIF files | <i>No.:</i> E2E-09.07 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details correction for the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.

A TIF file crediting the transactions being subject of the reclamation is generated by the TC and will hold the following types of transactions of the OBE under test:

- R2 transactions

Intention: The TIF file is correctly generated.

The TIF file generated in Test Step 1 are uploaded to the EasyGo HUB.

No rejection of the uploaded TIF file from the EasyGo HUB is received by the TC.

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| <i>Test name:</i> | Acknowledge credit billing details - generate TIC files | <i>No.:</i> E2E-09.08 |
|-------------------|--|------------------------------|

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| <i>Purpose:</i> | Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Toll Service Provider (EP) |
| <i>Executed by:</i> | Toll Service Provider (EP) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Service Provider (EP) acknowledges the billing details correction of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.</p> <p>The EP acknowledges the credit transactions of the TIF file generated by the TC crediting the transactions being subject of the reclamation. Following types of transactions of the OBE under test are in scope of this acknowledgement:</p> <ul style="list-style-type: none"> • R2 transactions |
| <i>Intention:</i> | <p>The TIF files are downloaded by the EP.</p> <p>The TIC files are correctly generated.</p> <p>The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.</p> |

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| <i>Test name:</i> | Report billing details corrected debit - generate TIF files | <i>No.:</i> E2E-09.09 |
|-------------------|--|------------------------------|

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| <i>Purpose:</i> | Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain. |
| <i>Actor:</i> | Toll Charger (TC) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Charger (TC) reports the billing details correction for the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.</p> <p>A TIF file debiting the corrected amount for the transactions being subject of the reclamation is generated by the TC and will hold the following types of transactions of the OBE under test:</p> |

- C3 transactions

Intention: The TIF file is correctly generated.
The TIF file generated in Test Step 1 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIF file from the EasyGo HUB is received by the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Acknowledge corrected billing details - generate TIC files | <i>No.:</i> E2E-09.10 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of crediting and reissuing processes with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) acknowledges the billing details correction of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.

The EP acknowledges the debit transactions of the TIF file generated by the TC debiting the corrected amount for the transactions being subject of the reclamation. Following types of transactions of the OBE under test are in scope of this acknowledgement:

- C3 transactions

Intention: The TIF files are downloaded by the EP.
The TIC files are correctly generated.
The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.
No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC claims payment for service usage from EP | <i>No.:</i> E2E-09.11 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).

The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-09.12 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files.
The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.

Intention: The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-09.13 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).

The EP generates and sends an invoice for the issuer fee to the TC.

Intention: The invoice for the issuer fee is sent to the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-09.14 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment for service usage from SU | <i>No.:</i> E2E-09.15 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment for service usage from the Service User (SU).

The EP generates and sends an invoice for service usage to the SU.

In the Agency model this invoice is in the name and on behalf of the TC.

In the Reseller model this invoice is in the EP's own name.

Intention: The invoice for for service usage is sent to the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | SU performs payment for service usage to EP | <i>No.:</i> E2E-09.16 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) performs the payment for service usage to the Toll Service Provider (EP).

Intention: The invoice for service usage is paid by the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP performs payment for service usage to TC | <i>No.:</i> E2E-09.17 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs the payment for service usage to the Toll Charger (TC).

Intention: The invoice for service usage is paid by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC performs payment of issuer fee to EP | <i>No.:</i> E2E-09.18 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of reconstructed transactions (gap closing) with the Toll Service Provider in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs the payment of the issuer fee to the Toll Service Provider (EP).

Intention: The invoice of the issuer fee is paid by the TC.

5.5.2.10 E2E-Scenario-10: OBE transactions - Service / Warning beep

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-10.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1 transactions while passing all kinds of toll stations of the TC.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

The paymentMeansExpiryDate set in the OBE under test is reached in less than 62 days.

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction with a service beep (2 beeps) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-10.02 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.

The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Case E2E-10.01) were performed, will hold the following types of transactions of the OBE under test:

- C1 transactions

Intention: The TIF files are correctly generated.

The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.

No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.

| | | |
|---------------------|--|------------------------------|
| Test name: | Acknowledge billing details - generate TIC files | No.: E2E-10.03 |
| Purpose: | Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain. | |
| Actor: | Toll Service Provider (EP) | |
| Executed by: | Toll Service Provider (EP) | |
| Equipment: | Not applicable. | |
| Description: | <p>The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.</p> <p>The EP acknowledges the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Case E2E-10.01) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:</p> <ul style="list-style-type: none"> • C1 transactions | |
| Intention: | <p>The TIF files are downloaded by the EP.</p> <p>The TIC files are correctly generated.</p> <p>The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.</p> | |

| | | |
|---------------------|--|------------------------------|
| Test name: | TC claims payment for service usage from EP | No.: E2E-10.04 |
| Purpose: | Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain. | |
| Actor: | Toll Charger (TC) | |
| Executed by: | Toll Charger (TC) | |
| Equipment: | Not applicable. | |
| Description: | <p>The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).</p> <p>The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.</p> | |
| Intention: | The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP. | |

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-10.05 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files. The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.

Intention: The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-10.06 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).

The EP generates and sends an invoice for the issuer fee to the TC.

Intention: The invoice for the issuer fee is sent to the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-10.07 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment for service usage from SU | <i>No.:</i> E2E-10.08 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment for service usage from the Service User (SU).
The EP generates and sends an invoice for service usage to the SU.
In the Agency model this invoice is in the name and on behalf of the TC.
In the Reseller model this invoice is in the EP's own name.

Intention: The invoice for for service usage is sent to the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | SU performs payment for service usage to EP | <i>No.:</i> E2E-10.09 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) performs the payment for service usage to the Toll Service Provider (EP).

Intention: The invoice for service usage is payed by the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP performs payment for service usage to TC | <i>No.:</i> E2E-10.10 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs the payment for service usage to the Toll Charger (TC).

Intention: The invoice for service usage is paid by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC performs payment of issuer fee to EP | <i>No.:</i> E2E-10.11 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of the signaling of the Service / Warning beep with the Toll Service Provider's OBE in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs the payment of the issuer fee to the Toll Service Provider (EP).

Intention: The invoice of the issuer fee is paid by the TC.

5.5.2.11 E2E-Scenario-11: OBE transactions - central retroactive payment

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Passages of toll stations - generate C1 transactions | <i>No.:</i> E2E-11.01 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) has a valid contract with a Toll Service Provider (EP) and drives in the toll domain of the Toll Charger (TC) with the OBE under test correctly mounted on the windscreen of his vehicle generating valid C1/D1 transactions while passing all kinds of toll stations of the TC.

The number of axles set on the OBE under test is lower than the actual number of axles of the vehicle which is used for performing the test including any trailer.

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

A couple of transactions shall be generated on all kinds of the TC's toll stations (toll stations, enforcement stations, ...).

Intention: The OBE under test signals a valid transaction (1 beep) on each of the passages of any kind of the TC's toll stations.

The transactions generated with the OBE under test are correctly processed and stored in the TC's system.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Retroactive payment - central solution | <i>No.:</i> E2E-11.02 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: A Service User (SU) contacts a Toll Charger's (TC's) Customer Service Center (CSC) to do retroactive payment for passages of the TC's toll stations at which a too low number of axles has been set at the OBE under test (see Test Case E2E-11.01).

The OBE under test is listed among the EP's entries of the global HGV file (OBE under test is whitelisted).

The OBE under test is not listed among the EP's entries of the global NAT file (OBE under test is not blacklisted).

Hint: In the Austrian toll domain such a retroactive payment is only possible within 96 hours after the respective passage of the TC's toll station has been performed.

Intention: The retroactive payment is successfully done.

No transactions of the OBE under test regarding the retroactive payment performed are processed and stored in the TC's system.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | Report billing details - generate TIF files | <i>No.:</i> E2E-11.03 |
|-------------------|--|------------------------------|

| | |
|---------------------|--|
| <i>Purpose:</i> | Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain. |
| <i>Actor:</i> | Toll Charger (TC) |
| <i>Executed by:</i> | Toll Charger (TC) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Charger (TC) reports the billing details of the OBE under test to the Toll Service Provider (EP) by submitting corresponding TIF files.</p> <p>The TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Case E2E-11.01) were performed, will hold the following types of transactions of the OBE under test:</p> <ul style="list-style-type: none"> • C1 transactions |
| <i>Intention:</i> | <p>The TIF files are correctly generated.</p> <p>The TIF files generated in Test Step 1 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIF files from the EasyGo HUB is received by the TC.</p> |

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | Acknowledge billing details - generate TIC files | <i>No.:</i> E2E-11.04 |
|-------------------|---|------------------------------|

| | |
|---------------------|--|
| <i>Purpose:</i> | Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain. |
| <i>Actor:</i> | Toll Service Provider (EP) |
| <i>Executed by:</i> | Toll Service Provider (EP) |
| <i>Equipment:</i> | Not applicable. |
| <i>Description:</i> | <p>The Toll Service Provider (EP) acknowledges the billing details of the OBE under test to the Toll Charger (TC) by submitting corresponding TIC files.</p> <p>The EP acknowledges the transactions of the TIF file(s) generated by the TC at the end of the day, on which the passages with the OBE under test (see Test-Case E2E-11.01) were performed. Following types of transactions of the OBE under test are in scope of this acknowledgement:</p> <ul style="list-style-type: none"> • C1 transactions |
| <i>Intention:</i> | <p>The TIF files are downloaded by the EP.</p> <p>The TIC files are correctly generated.</p> <p>The TIC files generated in Test Step 2 are uploaded to the EasyGo HUB.</p> <p>No rejection of the uploaded TIC files from the EasyGo HUB is received by the EP.</p> |

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC claims payment for service usage from EP | <i>No.:</i> E2E-11.05 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) claims payment for service usage from from the Toll Service Provider (EP).

The TC generates and sends an account statement (in the Agency modell) respectively an invoice (in the Reseller model) to the EP.

Intention: The account statement (in the Agency modell) respectively the invoice (in the Reseller model) is sent to the EP.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | EP validates claimed payment for service usage from TC | <i>No.:</i> E2E-11.06 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) validates the Toll Charger's (TC's) claimed payment for service usage against the exchanged TIF and TIC files.

The TC's claim for payment for service usage shall only include such transactions that have been sent to the EP within a TIF file and acknowledged by the EP by sending an acknowledgement in a TIC file before.

Intention: The TC's claimed payment for service usage is found to correspond to the exchanged TIF and TIC files.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment of issuer fee from TC | <i>No.:</i> E2E-11.07 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment of issuer from from the Toll Charger (TC).
The EP generates and sends an invoice for the issuer fee to the TC.

Intention: The invoice for the issuer fee is sent to the TC.

| | | |
|-------------------|---|------------------------------|
| <i>Test name:</i> | TC validates claimed payment of issuer fee from EP | <i>No.:</i> E2E-11.08 |
|-------------------|---|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) validates the Toll Service Provider's (EP's) claimed payment of the issuer fee.

Intention: The EP's claimed payment of the issuer fee is validated.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP claims payment for service usage from SU | <i>No.:</i> E2E-11.09 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) claims payment for service usage from the Service User (SU).
The EP generates and sends an invoice for service usage to the SU.
In the Agency model this invoice is in the name and on behalf of the TC.
In the Reseller model this invoice is in the EP's own name.

Intention: The invoice for for service usage is sent to the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | SU performs payment for service usage to EP | <i>No.:</i> E2E-11.10 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Service User (SU)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Service User (SU) performs the payment for service usage to the Toll Service Provider (EP).

Intention: The invoice for service usage is payed by the SU.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | EP performs payment for service usage to TC | <i>No.:</i> E2E-11.11 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Service Provider (EP)

Executed by: Toll Service Provider (EP)

Equipment: Not applicable.

Description: The Toll Service Provider (EP) performs the payment for service usage to the Toll Charger (TC).

Intention: The invoice for service usage is payed by the EP.

| | | |
|-------------------|--|------------------------------|
| <i>Test name:</i> | TC performs payment of issuer fee to EP | <i>No.:</i> E2E-11.12 |
|-------------------|--|------------------------------|

Purpose: Verification of the correct handling of central retroactive payments of the Toll Service Provider's Service Users in the Austrian toll domain.

Actor: Toll Charger (TC)

Executed by: Toll Charger (TC)

Equipment: Not applicable.

Description: The Toll Charger (TC) performs the payment of the issuer fee to the Toll Service Provider (EP).

Intention: The invoice of the issuer fee is payed by the TC.

5.6 OBE pilot operation

5.6.1 Objectives and overview

In the pilot operation phase a limited number of OBE is installed in vehicles of friendly users who are paying the toll with the EETS OBE under test.

Precondition for starting the pilot operation are successful E2E tests and settlement of all necessary commercial items.

5.6.2 Organization

The EETS Provider is responsible for the organization of the pilot operation. The organization of the pilot operation plan shall be developed and planned in close cooperation between the EETS Provider and ASFINAG.

5.6.3 Parameters and limitations

The following values define the limitation of the pilot operation:

- Number of vehicles / OBE: **50 - 500**
- Minimum duration of pilot operation: **2 months**
- Minimum required number of performed DSRC transactions during the pilot operation:
100.000

If the result of the pilot operation is OK, the OBE has passed the approval process and the OBE certification “Suitability for Use” in the ASFINAG EETS toll context is issued.

5.6.4 Result evaluation

In general the assessment of transaction quality is carried out according to the document “Quality measurement (quality parameters and quality of service) for EETS Providers”

ASFINAG is measuring the transaction quality and producing a report. The report including the result is delivered to the EETS Provider.

5.6.5 End of Pilot Operation

If the result of the pilot operation is OK, the OBE has passed the approval process and the OBE certification “Suitability for Use” in the ASFINAG EETS toll context is issued.

6 Recertification process

6.1 Change report

6.1.1 OBE

During the system operation a planned change of the OBE hardware or software shall be reported to ASFINAG in written form before used in the ASFINAG toll context. The OBE software or hardware change report is the base for the decision concerning which phases and steps of the approval process shall be repeated for the recertification of the OBE.

A major change of the OBE could result in a full certification process defined for a new OBE type.

Any kind of an OBE change detected by ASFINAG in the field without prior reporting and positive tests (if tests are decided by ASFINAG) may result in a withdrawal of the OBE and/or EETS Providers "Suitability for Use" certification.

6.1.2 Back office interface

A change of the back office interface is only possible after agreement with ASFINAG. Such a change shall be handled with a process agreed between the EETS Provider and ASFINAG based on the impact of the interface change. This process is outside the scope of the current document.

Additional information can be found in [EETS_proc].

6.2 Basic OBE testing

It is expected, that the EETS provider (resp. his OBU manufacturer) performs a basic set of DSRC tests with prototypes after any OBE change, providing a protocol of the performed tests to ASFINAG.

These basic tests are part of the information required for the decision which tests are necessary for a recertification.

7 Annex A – OBE personalization data example

The tables below contains the OBE personalization data test sets and the variation for the trailer axles test cases for tests acc to chapters 5.2 and 5.3 (Tests in test environment), if not otherwise requested by ASFINAG.

EFContextMark data:

ContractProvider: 0x C04001
 TypeOfContract: 0x F200
 ContextVersion: 0x A6
 Keyset: MEDIA Testkeyset

The number of trailer axles and the trailer indicator are not part of the permanent OBE personalization and shall be set to a default value of zero. The value for the test is set immediately before the test using the OBE MMI. The values in the table below define the values set for the test cases using the MMI.

| LPN no | Vehicle Class T CCC LLLL | Vehicle Axles | | Euro Value |
|--------|-----------------------------|---------------|-------------|------------|
| | | Tractor | Trailer | |
| 1 | X 011 XXXX (bus) | 2 | 0 - 2 | 3 |
| 2 | X 011 XXXX (bus) | 3 | 0 - 1 | EEV *) |
| 3 | X 100 XXXX (truck < 12t) | 2 | 0 - 1 -2- 3 | 0 |
| 4 | X 101 XXXX (truck > 12t) | 2 | 0 - 1 -2- 3 | 1 |
| 5 | X 111 XXXX (vehicle > 3.5t) | 2 | 0 - 1 | 2 |
| 6 | X 111 XXXX (vehicle > 3.5t) | 3 | 0 - 1 | 3 |
| 7 | X 101 XXXX (truck > 12t) | 4 | 0 - 2 | 6 |
| 8 | X 001 XXXX (not liable) | 2 | 0 - 2 | 4 |
| 9 | X 100 XXXX (truck < 12t) | 3 | 0 - 1 - 2 | 4 |
| 10 | X 101 XXXX (truck > 12t) | 3 | 0 - 1 - 2 | 5 |

Table 1: OBE personalization data test sets

*) EEV coded to VehicleSpecificCharacteristics.EuroValue with value= 15 acc. to [EETS_data]

Note: Each test OBE configuration can be identified using the DSRC communication by its unique LPN.

The table OBE personalization data test sets defines the values for the following attributes below:

Attribute 16: Vehicle License Plate Number (LPN no)

| LPN no. | Country-Code | | Alphabet-Indicator | | Length determinant | LPN coding | LPN content |
|---------|----------------|----------------|--------------------|------------------|--------------------|--------------------------|-------------|
| | b ₉ | b ₀ | b ₄ | b ₀ | | | |
| 1 | 11000 | 00001 (AT) | 000000 | (latin 1) | 14 | WDST1EETS | |
| 2 | 11000 | 00001 (AT) | 000000 | (latin 1) | 14 | WDST22EETS | |
| 3 | 11000 | 00001 (AT) | 000000 | (latin 1) | 14 | WDST33EETS | |
| 4 | 11000 | 00001 (AT) | 000000 | (latin 1) | 14 | WDST44EETS1234 | |
| 5 | 11000 | 00001 (AT) | 000000 | (latin 1) | 14 | WDST5EETS | |
| 6 | 11000 | 00001 (AT) | 000000 | (latin 1) | 14 | WDST66EETS | |
| 7 | 10010 | 10000 (DE) | 000000 | (latin 1) | 14 | TÖL777TEST | |
| 8 | 00110 | 00011 (NO) | 000000 | (latin 1) | 14 | AZ123456789012 | |
| 9 | 01010 | 11100 (RU) | 000000 | (latin 1) | 14 | 510dn09 | 510ДИ09 |
| 10 | 01010 | 11100 (RU) | 000100 | (latin/Cyrillic) | 14 | "510"+ 0xB4+ 0xB8 + "10" | 510ДИ10 |

Table 2: LPN data sets

Attribute 17: Vehicle Class

The VehicleClass according to EN 15509 has the bit ordered substructure T CCC LLLL, where:

- T = Trailer Indicator
- CCC = Harmonized European Vehicle Class
- LLLL = Local Vehicle Classes

Attribute 19: Vehicle Axles

VehicleAxlesNumber.NumberOfAxles.Trailer

VehicleAxlesNumber.NumberOfAxles.Tractor

Attribute 22: Vehicle Specific Characteristics

EnvironmentalCharacteristics.EuroValue

For additional information to the attributes see [EETS_data] and [EFC API] chapter 'EFC Attributes'.

For End2End Tests in productive environment suitable personalization data test sets and keysets are to be agreed between TC and EP.

8 Annex B - References

| Reference | Document Ref | Date / Version | Document title |
|----------------|--------------|----------------|---|
| [EETS_acc] | | | EETS Acceptance Procedures (this document) |
| [EETS-OBE_req] | | | EETS-OBE Requirements Specification |
| [EETS_data] | | | EETS DSRC Tolling Data Specification (Replacement for “EETS-OBE Personalization, Configuration and Operation Data Description”) |
| [EETS_proc] | | | Change- and Incident management |
| [EasyGo-206] | | | EasyGo test strategy (EasyGo Document 206) |
| [EasyGo-207] | | | Interface test specification Central systems – EasyGo HUB (EasyGo Document 207) |
| [EP_IF] | | | EETS Back Office Interface Specification |
| [EP_QM] | | | Quality Measurement for EETS Providers |
| [IAP] | EN 15509 | 2014 | EN 15509:2007 Road Traffic and Transport Telematics (RTTT) – Electronic Fee Collection – Interoperability application profile for DSRC |
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| Reference | Document Ref | Date / Version | Document title |
|-------------------|---------------------------------|--------------------|--|
| [EFC API] | EN ISO 14906:2011/ Amd1:2015 | 2011/ Amd1:2015 | Road Traffic and Transport Telematics (RTTT) – Electronic Fee Collection – Application interface definition for dedicated short range communication |
| [GSS] | GSS | V3.2:2003 | 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) |
| [L1] | EN 12253 | 2004 | Road Transport and Traffic Telematics (RTTT) – Dedicated Short-Range Communication (DSRC) – Physical layer using microwave at 5.8 GHz |
| [L2] | EN 12795 | 2003 | Road Transport and Traffic Telematics (RTTT) – Dedicated Short-Range Communication (DSRC) – DSRC data link layer: Medium access and logical link control |
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| [AVI No] | EN ISO 14816 | 2005 | Road Traffic and Transport Telematics (RTTT) – Automatic Vehicle and Equipment Identification – Numbering and Data Structures |
| [AVI No register] | | | http://www.tc278.eu/index.php/14816-register |