

MACHINE READABLE TRAVEL DOCUMENTS

(Logo)

TECHNICAL REPORT

RF PROTOCOL AND APPLICATION TEST STANDARD FOR E-PASSPORT - PART 2

TESTS FOR AIR INTERFACE, INITIALISATION, ANTICOLLISION AND TRANSPORT PROTOCOL

Version: **0.9**

Date – Feb 10, 2006

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RF protocol and application test standard for e-Passport - part 2

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1 Introduction

1.1 Scope and purpose

An essential element of the new ICAO compliant e-Passport is the addition of a Secure Contactless Integrated Circuit (SCIC) that securely holds biometric data of the passport bearer within the ICAO defined Logical Data Structure (LDS).

Successful integration of the SCIC into the e-Passport depends upon active international cooperation between many companies and organizations.

The e-Passport has been specified and designed to operate correctly across a wide variety of reading infrastructures worldwide. The risk profile for the e-Passport indicates a high impact if that design includes a widespread error or fault. Therefore, it is essential that all companies and organizations involved make all reasonable efforts to minimize the probability that this error or fault remains undetected before that design is approved and e-Passports are issued.

This document defines a test plan for the contactless part of the e-Passport. These tests are divided into tests of the physical and electrical parameters according to ISO/IEC14443-1 and -2, and tests of the initialization & anticollision and the transport protocol according to ISO/IEC14443-3 and -4. In order for the SCIC to operate correctly, many functional layers of technology MUST work together. The purpose of this document is to define in depth the tests to be performed to minimize the probability that an error or fault remain undetected before the design gets approved.

1.2 Assumptions

1.2.1 Maintenance of this TR regarding ISO standards

This technical report is based on the currently available versions of ISO standards and amendments as they are referenced in chapter 1.7. Based on the further development of these referenced ISO standards and their amendments, this report will be revised by SC17/WG3/TF4.

1.3 Build-up of the test plan

TBD

1.4 Terminology

The key words "MUST", "SHALL", "REQUIRED", "SHOULD", "RECOMMENDED", and "MAY" in this document are to be interpreted as described in [R3].

MUST This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.

MUST NOT This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.

SHOULD This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

SHOULD NOT This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable

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or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.

MAY This word, or the adjective "OPTIONAL", mean that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option **MUST** be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option **MUST** be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.)

1.5 Glossary

TR0

Guard time between the end of a PCD transmission and the start of the SCIC subcarrier generation

TR1

Synchronization time between the start of the SCIC subcarrier generation and the start of the SCIC subcarrier modulation

TR2

Synchronization time between the start of the SCIC's EOF and the start of the PCD's next SOF.

Sample

A sample is one piece of the total number of e-Passports required and presented for testing according to this specification.

DUT

A device under test is a sample that has been placed in the test apparatus.

1.6 Abbreviations

Abbreviation	
AA	Active authentication
ATQB	Answer to a request of modulation type B
ATS	Answer to select
ATTRIB	PICC selection command for type B
BAC	basic access control
CID	Card identifier (layer 4)
DUT	Device under test
EAC	Extended access control
EGT	Extra guard time
EOF	End of frame
ESD	Electrostatic discharge
etu	Elementary time unit
fc	Carrier frequency (13.56MHz)

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Abbreviation	
FDT	Frame delay time
fs	Subcarrier frequency (13.56MHz)
FSD	Frame size integer
hf	Overshoot of the falling edge of the type B modulation
hr	Overshoot of the rising edge of the type B modulation
LDS	Logical Data Structure
m	Modulation index
NAD	Node address
PCD	Proximity coupling device
PICC	Proximity integrated circuit card
RATS	Request for an answer to select
REQA	Request command type A
REQB	Request command type B
RF	Radio frequency
RT	Room temperature
SCIC	Secure contactless integrated circuit
SOF	Start of frame
t _r , t _f	Rise time, fall time

1.7 Reference documentation

The following documentation serves as a reference for this technical report:

- [R1] *Technical Report: Development of a Logical Data Structure – LDS for optional capacity expansion technologies, version 1.7*
- [R2] *Technical Report: PKI for Machine Readable Travel Documents offering ICC Read-Only access, version 1.1*
- [R3] *RFC 2119, S. Bradner, "Key Words for Use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997*
- [R4] *CD ISO/IEC 14443-1:2005, Proximity Cards: Physical Characteristics*
- [R5] *ISO/IEC 14443-2:2001, Proximity Cards: Radio Frequency Power and Signal Interface*
- [R6] *ISO/IEC 14443-3:2001, Proximity Cards: Initialization and Anticollision*
- [R7] *ISO/IEC 14443-4:2001, Proximity Cards: Transmission protocol*
- [R8] *ISO/IEC 14443-2:2001/AM1:2005, Proximity Cards: Radio Frequency Power and Signal Interface (Amendment 2: Bit Rates of fc/64, fc/32 and fc/16)*
- [R9] *ISO/IEC 14443-3:2001/AM1:2005, Proximity Cards: Initialization and Anticollision (Amendment 1: Bit Rates of fc/64, fc/32 and fc/16)*
- [R10] *ISO/IEC 10373-6:2001, Test Methods for Proximity Cards*
- [R11] *ISO/IEC 10373-6:2001/FDAM1: Test Methods for Proximity Cards (Amendment 1: Protocol Test Methods for Proximity Cards)*
- [R12] *ISO/IEC 10373-6:2001/AM2:2003: Test Methods for Proximity Cards (Amendment 2: Improved RF Test Methods)*
- [R13] *ISO/IEC 10373-6:2001/FDAM4, Test Methods for Proximity Cards (Amendment 4: Additional Test Methods for PCD RF Interface and PICC Alternating Field Exposure)*

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- [R14] *ISO/IEC 10373-6:2001/FDAM5, Test Methods for Proximity Cards (Amendment 5: Bit Rates of fc/64, fc/32 and fc/16)*
- [R15] *IEC 61000-4-2:2001, Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test - Electrostatic discharges - Immunity test*
- [R16] *ISO/IEC 14443-3:2001/FDAM2, Proximity Cards: Initialization and Anticollision (Amendment 2: RFU)*
- [R17] *ISO/IEC 14443-4:2001/FDAM1, Proximity Cards: Transparent Transport protocol (Amendment 1: RFU)*
- [R18] *ICAO Doc 9303 Part 1 Volume 2, 6th edition, 2005.*

2 General test requirements

The following sub-clauses specify the different test setups, the nominal values used for the tests, and a recommendation for the format of the test report.

Tests for data rates of fc/128 and fc/32 are mandatory and SHALL be applied. Other data rates indicated in the ATS/ATQB SHALL also be tested.

Depending on the implementation statement of the applicant, type A or type B tests SHALL be performed.

All tests are mandatory unless specified as “optional” or “conditional”. Conditional tests MUST be performed if they are applicable.

For tests of layers 1 and 2 the minimum number of samples provided for testing is three. The applicant MAY request that a larger number of samples be tested.

2.1 Test setup

The PCD assembly (Test Apparatus) that is defined in [R10] is the basis for the physical and electrical tests. For layer 2 tests (communication stability and operating field strength), the existing ISO test setup has to be extended. Moreover, this setup has to be adapted to carry the e-Passport with the additional ability to center the ID-1 sized antenna¹ of the e-Passport in the test PCD assembly according to [R10].

The test PCD in the test setup is intended to be used in time-limited measurements to avoid any overheating of the individual components (e.g. SCIC). For all functional tests, the chip’s self-heating effect SHOULD not exceed 25°C over ambient temperature.

2.2 Equipment

Most of the tests need some additional equipment, such as an arbitrary waveform generator and an RF amplifier. The oscilloscope probes MUST have an input capacitance $C < 12$ pF.

¹ Some of the following tests are based on Class-1 sized antennas [R13]. If the e-Passports antenna does not comply to the Class-1 specification, those tests might not generate accurate results.

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2.3 Nominal values

Unless otherwise specified, the following environment parameters and nominal values SHALL be used:

Parameter	Value	To be applied to
Environment temperature	23 °C ± 3 °C (73 °F ± 5 °F)	Type A and B
Relative humidity	25 % to 75 %	Type A and B
Data rate	fc/128	Type A and B
Modulation index m	100 % 11 %	Type A Type B
t1	3 µs	Type A
t2	0.5 µs	Type A
t3	1.5 µs	Type A
t4	400ns	Type A
Overshoot	0%	Type A and B
Rise time t _r , fall time t _f	≤ 1 µs	Type B
Start-of-Frame timing (SOF)	10.5 etu “0” followed by 2.5 etu “1”	Type B
End-of-Frame timing (EOF)	10.5 etu “0”	Type B

The parameters are defined in accordance with [R5].

2.4 Report

The test report SHALL include the number of successful evaluations versus the total number of evaluations for each sample and for each test. A description of each test, the information whether the result was a pass or a fail, and the date of the tests MUST be included.

For all functionality tests, the report has to state what tools and methods have been used to verify the functionality of the e-Passport.

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2.5 Implementation conformance statement

In order to set up the tests properly, an applicant SHALL provide the information specified in Table 1 below.

Table 1: Test precondition table "Information on the product"

Information for test setup	Applicant declaration
Location of antenna in e-Passport <ul style="list-style-type: none">• which page• which area in the page	
Size of antenna <ul style="list-style-type: none">• dimensions• compliance to Class-1 definition	
Electrical parameters of antenna <ul style="list-style-type: none">• Resonance frequency range	
Modulation type <ul style="list-style-type: none">• Type A or B	
e-Passport shielded or not and how	
Data rates supported as claimed by the ATS/ATQB <ul style="list-style-type: none">• 106 kbit/sec• 212 kbit/sec• 424 kbit/sec• 848 kbit/sec	
Random or fixed UID	
Access control applied <ul style="list-style-type: none">• Plaintext• Basic Access Control• Extended Access Control	
Authentication supported <ul style="list-style-type: none">• Passive Authentication• Active Authentication	
Commands supporting WTX	

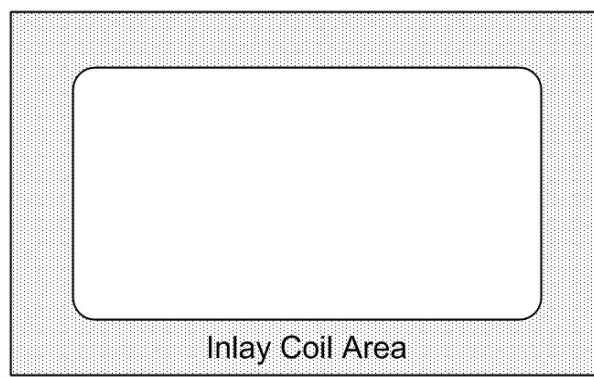
3 Layer 1 tests

3.1 Class-1 verification test (Conditional)

This is an optional test that SHALL be applied if the applicant claims compliance with Class-1 in Table 1.

Test Description: The purpose of this test is to check if the physical coil dimensions meet the requirements according to [R4]. The SCIC antenna SHALL be entirely located within a zone defined by two rectangles:

- external rectangle: 81mm x 49mm
- internal rectangle: 64mm x 34mm, 3mm radius



Conditions: Minimum number of samples: 3

Report: The test report SHALL state whether the coil geometry of the e-Passport is in accordance with Class 1 definition.

3.2 Static electricity (ESD) test

Test Description: The purpose of this test is to check the behavior of the SCIC after an electrostatic discharge (ESD) on the test sample (according to [R13]). The device under test is exposed to a simulated electrostatic discharge (ESD, human body model). Its basic operation is checked after the exposure.

The test SHALL be performed according to the procedures defined in [R13], clause 5.3, "Static Electricity Test".

Test Setup: The test setup SHALL be according to [R13].

Conditions: Minimum number of samples: 3

Report: The test report SHALL state whether the e-Passport operates as intended after exposure to the static electric field.

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3.3 Alternating magnetic field test

Test Description: The purpose of this test is to check the behavior of the e-Passport in relation to alternating magnetic field exposure according to [R13].

Alternating magnetic field SHALL be tested at 13.56 MHz. No tests are required at other frequencies.

Perform the test according to the test procedure defined in [R13], clause 5.1.2 “Alternating magnetic field; 12A/m test”.

Conditions: Minimum number of samples: 3
Parameters: Field strength 0 A/m, 10 A/m, 12A/m
Report: The test report SHALL state whether the e-Passport operates as intended after exposure to an alternating magnetic field.

4 Layer 2 tests

The ISO Test Setup (Test-apparatus) does not have the possibility to test more than a request command or to check the response of correctness but it offers the possibility to test various electrical parameters.

For the following tests, it is RECOMMENDED to have signal patterns that start with RF off, then expose for 5ms a field with 13.56MHz carrier, and afterwards modulate this field with a REQA or REQB command according to the used type, which SHOULD be modified with respect to shapes (modulation index), bit-length, falling and rising edges, as defined further on. A 13.56 MHz carrier without modulation SHALL follow the command. For this procedure, the ISO test setup has to be used as a PCD antenna. The calibration of the field strength has to be done in advance. Then, the e-Passport has to be placed at the DUT position. Afterwards, the field strength has to be readjusted.

Combinations of the following layer 2 and 3 tests are possible if the test coverage is not influenced; e.g. combining the frame delay time test with the operating field strength test or the operating field strength test with testing the load modulation amplitude is possible.

4.1 Load modulation amplitude test

Test Description: The purpose of this test is to determine the load modulation amplitude of the e-Passport according to [R12] (amplitude [mV] $\geq 30/H^{1.2}$ mVpeak). Perform the test according to Figure 1 below.

For a detailed description of the load modulation test, see

- ISO/IEC 14443-2 Load modulation ($30/H^{1.2}$ mVpeak) [R5]
- ISO/IEC 10373-6 AM2, PICC load modulation amplitude [R12]

Conditions: Minimum number of samples: 3
Data rate fc/128
Parameters: Field strength mandatory: 1.5 A/m, 4.5 A/m, 7.5 A/m
optional : 2.5 A/m, 3.5 A/m, 5.5 A/m, 6.5 A/m
Temperature -10°C, RT, 50°C
Report: The test report SHALL state the load modulation amplitudes.

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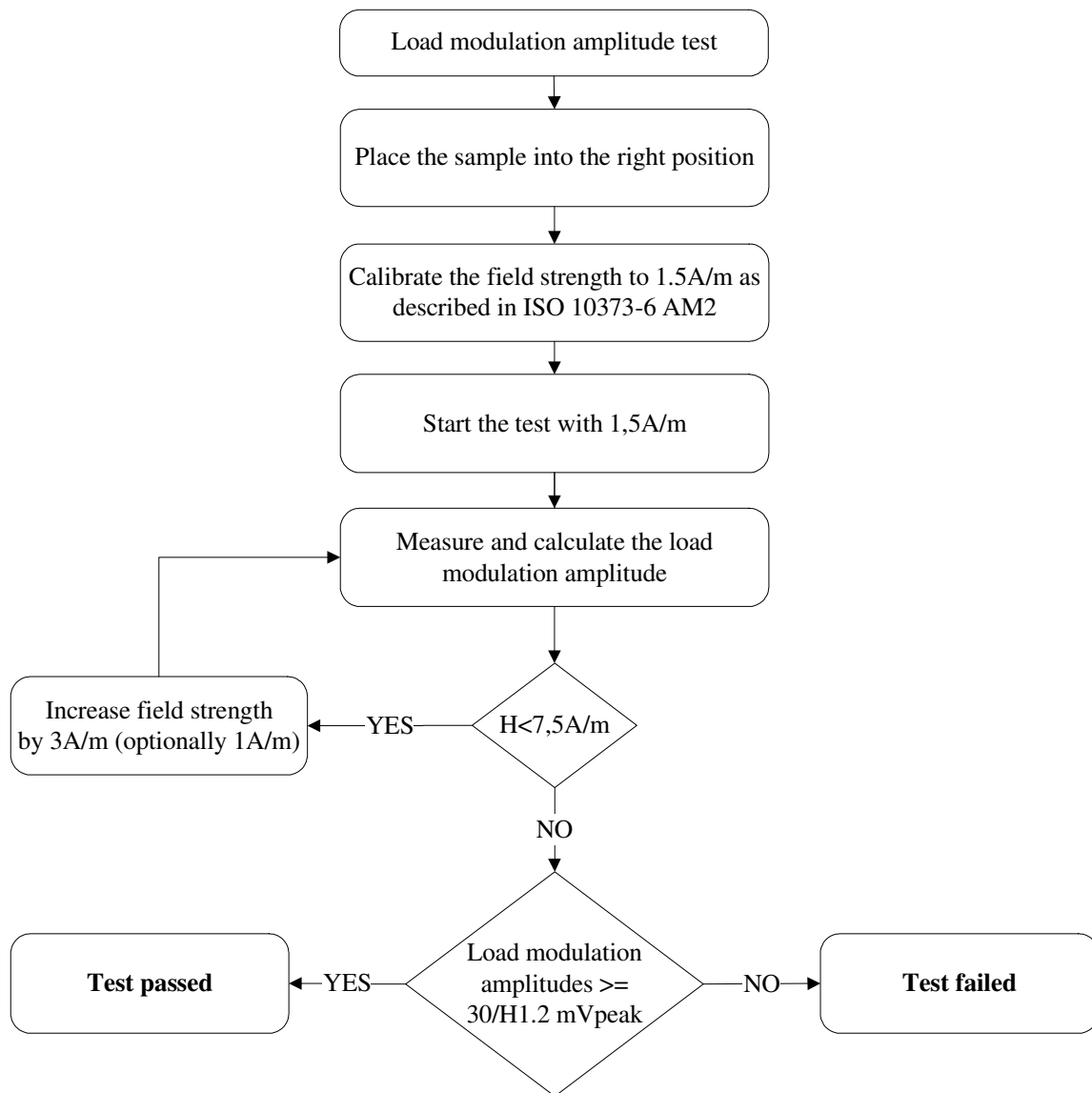


Figure 1: Test procedure for the load modulation amplitude test

Note:

For this functional test, the chip's self heating effect SHOULD not exceed 25°C over ambient temperature.

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4.2 Operating field strength test

This test checks the required performance between 1.5 and 7.5 A/m. The e-Passport SHALL operate as intended over the full range.

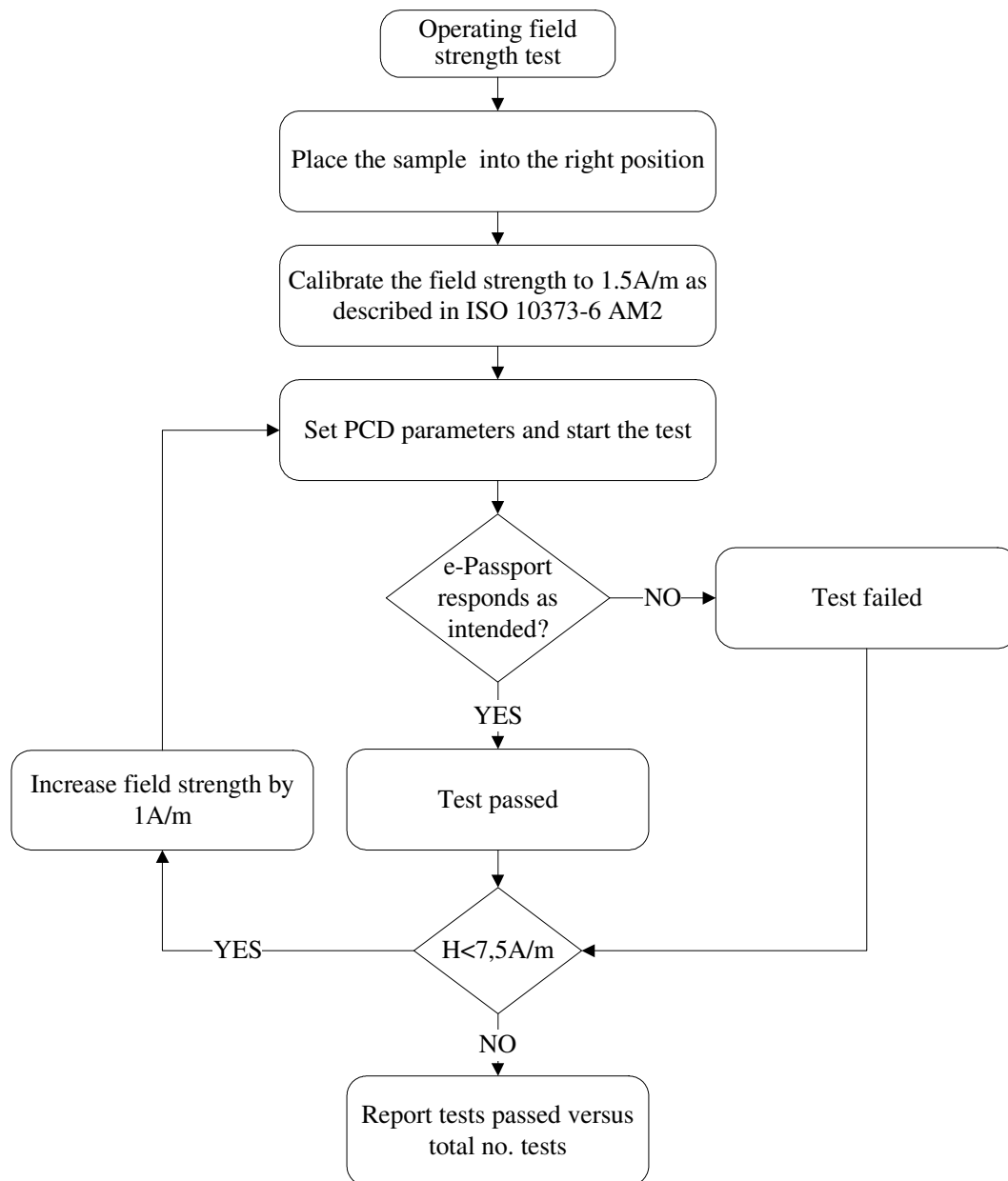


Figure 2: Test procedure for the operating field strength test (Type A and B)

Note:

The operating field strength test can be combined with the following test “communication stability” (see 4.3). Since the operating field strength MAY be used as an isolated functionality check test, it is specified in a separate chapter of this document.

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4.2.1 Type A

Test Description: The purpose of this test is to check if the e-Passport meets the energy performance requirements according to [R5]. The e-Passport SHALL operate as intended within 1.5 A/m and 7.5 A/m.

Test Setup: The following command sequence has to be executed once for each combination of parameters and each sample:

REQA → ANTICOL → SELECT → RATS → PPS →
TEST_COMMAND_SEQUENCE1

See for annex B for a list of possible test command sequences depending on the operation mode, e.g. plain text, BAC, AA, EAC.

Conditions: Minimum number of samples: 3
Parameters Field strength 1.5 A/m, 2.5 A/m, 3.5 A/m, 4.5 A/m, 5.5 A/m, 6.5 A/m, 7.5 A/m
Data rate $fc/128$, $fc/64$, $fc/32$, $fc/16^2$
Temperature -10°C , RT, 50°C
Report: The test report SHALL include the number of passed tests versus the total number of tests, a test description and the number of samples and the date.

Modifications done according:

- Reference ISO/IEC 10373-6 AM4 [R13], Conditions for type A
- Operating field strength ([R5]): H_{\min} - H_{\max}

Table 2 Fix Parameter Table for $fc/128$

Modulation index m	100 %
Data rate	$fc/128$
t1	3 μs
t2	0.5 μs
t3	1.5 μs
t4	400ns
Overshoot	0

Table 3 Fix Parameter Table for $fc/64$, $fc/43$, $fc/16$

Modulation index m	30 % ³	30 %	30 %
Data rate	$fc/64$	$fc/32$	$fc/16$
t1	$20/fc$	$10/fc$	$5/fc$
t2	$16/fc$	$8/fc$	$3/fc$
t3	$8/fc$	$7/fc$	$8/fc$
Overshoot	0	0	0

² All combinations of SCIC supported bit rates SHALL be tested.

³ The modulation index m is calculated as follows:
 $m = (\text{max level} - \text{min level}) / (\text{max level} + \text{min level})$.

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Note:

For each data rate the corresponding table SHALL be taken into account. In addition to data rates higher than $fc/128$, it is also necessary to implement more than a request command (REQA). For data rates higher than $fc/128$, several commands at $fc/128$ have to be executed before starting with higher data rate tests.

For data rates higher than $fc/128$, the sequence of test commands defined above has to be executed at the different magnetic field strengths and temperatures.

4.2.2 Type B

Test Description: The purpose of this test is to check if the e-Passport meets the energy performance requirements according to [R5]. The e-Passport SHALL operate as intended within 1.5 A/m and 7.5 A/m.

Test Setup: The following command sequence has to be executed once for each combination of parameters and each sample:

REQB → ATTRIB → TEST_COMMAND_SEQUENCE1

See for annex B for a list of possible test command sequences depending on the operation mode, e.g. plain text, BAC, AA, EAC.

Conditions: Minimum number of samples: 3

Parameters: Field strength 1.5 A/m, 2.5 A/m, 3.5 A/m, 4.5 A/m, 5.5 A/m, 6.5 A/m, 7.5 A/m
Data rate $fc/128$, $fc/64$, $fc/32$, $fc/16^4$
Temperature -10°C , RT, 50°C

Report: The test report SHALL include the number of passed tests versus the total number of tests, a test description and the number of samples and the date.

Table 4: Data rate = $fc/128$, $fc/64$ and $fc/32$

Modulation index m	11 %
t_r , t_f	$\leq 1\mu\text{s}$
h_r , h_f	0

Table 5: Data rate = $fc/16$

Modulation index m	11 %
t_r , t_f	$\leq 0.8\mu\text{s}$
h_r , h_f	0

⁴ All combinations of SCIC supported bit rates SHALL be tested.

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4.3 Communication stability test

Acceptance of variation of modulation index, overshoot and edges (timings)

This test SHALL check the stability of data exchange by varying different parameters in their allowed range. These parameters are field strength, rise and fall times, modulation index, overshoots etc. All parameters are defined in [R5] and in [R8] for higher data rates.

Modifications done according:

- Reference ISO/IEC 10373-6 AM2 [R12]
- Reference ISO/IEC 10373-6 AM4 [R13] - PICC reception - Conditions for type A
- Reference ISO/IEC 10373-6 AM5 [R14]
- Reference ISO/IEC 14443-2 [R5]
- Reference ISO/IEC 14443-2 AM1 2001 [R8]

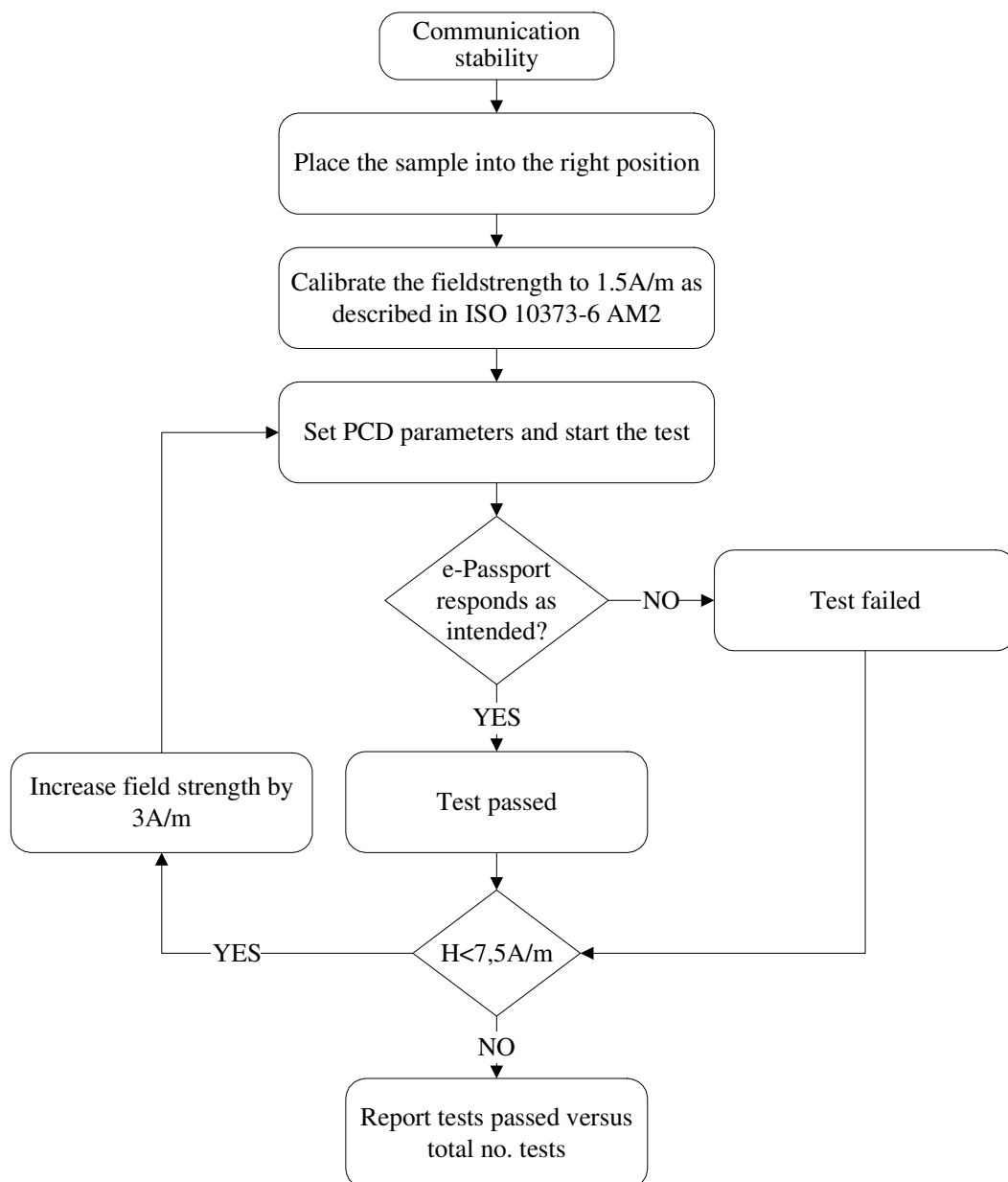


Figure 3: Test procedure for the communication stability test (Type A and B)

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4.3.1 Type A

Test Description: The purpose of this test is to determine the communication stability versus field strength and rise and fall times according to ISO/IEC 14443-2 [R5] and ISO/IEC 10373-6 AM4 [R13] and AM5 [R14]. The e-Passport SHALL operate as intended within 1.5 A/m and 7.5 A/m.

Test Setup: The following command sequence has to be executed once for each combination of parameters and each sample:

```
REQA → ANTICOL → SELECT → RATS → PPS →  
TEST_COMMAND_SEQUENCE1
```

See for annex B for a list of possible test command sequences depending on the operation mode, e.g. plain text, BAC, AA, EAC.

Conditions: Minimum number of samples: 3
Parameters Temperature -10°C, RT, 50°C
Field strength 1.5 A/m, 4.5 A/m, 7.5 A/m
Data rate fc/128, fc/64, fc/32, fc/16

Report: The test report SHALL include the number of passed tests versus the total number of tests, a test description and the number of samples and the date.

Overshoot parameter definition:

- Amplitude (%): defines the increase in % related to the nominal value of the carrier (e.g. overshoot amplitude 10% → carrier amplitude = 110%)
- Length (µs): defines the time of the positive Overshoot-Envelope between two nominal values. If length is not defined the rising and falling time of the overshoot SHALL be equal.
- Envelope: SHALL increase and decrease monotonically.
- Only one positive Overshoot SHALL occur during one test.

Table 6: Test conditions for fc/128

Condition	H (A/m)	t1 (µs)	t2 (µs)	t3 (µs)	t4 (µs)	m (%)	Overshoot Amplitude (%)	Overshoot Length (µs)
1	1,5	3	0,5	1,5	0,4	100	0	0
2	1,5	3	0,5	0,8	0,4	100	10	0,8
3	1,5	2	0,7	1,5	0,4	90	0	0
4	1,5	2	0,7	0,8	0,4	90	10	0,8
5	4,5	3	0,5	1,5	0,4	100	0	0
6	4,5	3	0,5	0,8	0,4	100	10	0,8
7	4,5	2	0,7	1,5	0,4	90	0	0
8	4,5	2	0,7	0,8	0,4	90	10	0,8
9	7,5	3	0,5	1,5	0,4	100	0	0
10	7,5	3	0,5	0,8	0,4	100	10	0,8
11	7,5	2	0,7	1,5	0,4	90	0	0
12	7,5	2	0,7	0,8	0,4	90	10	0,8

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Table 7: Test conditions for fc/64

Condition	H (A/m)	t1	t2	t3	a
1	1,5	20/fc	10/fc	12/fc	0,6
2	1,5	20/fc	16/fc	8/fc	$\leq 0,05$
3	1,5	15/fc	8/fc	12/fc	0,6
4	1,5	15/fc	12/fc	8/fc	$\leq 0,1$
5	4,5	20/fc	10/fc	12/fc	0,6
6	4,5	20/fc	16/fc	8/fc	$\leq 0,05$
7	4,5	15/fc	8/fc	12/fc	0,6
8	4,5	15/fc	12/fc	8/fc	$\leq 0,1$
9	7,5	20/fc	10/fc	12/fc	0,6
10	7,5	20/fc	16/fc	8/fc	$\leq 0,05$
11	7,5	15/fc	8/fc	12/fc	0,6
12	7,5	15/fc	12/fc	8/fc	$\leq 0,1$

Table 8: Additional test conditions for a bit rate of fc/32

Condition	H (A/m)	t1	t2	t3	a
1	1,5	10/fc	5/fc	10/fc	0,6
2	1,5	10/fc	8/fc	7/fc	$\leq 0,2$
3	1,5	8/fc	4/fc	10/fc	0,6
4	1,5	8/fc	6/fc	7/fc	$\leq 0,3$
5	4,5	10/fc	5/fc	10/fc	0,6
6	4,5	10/fc	8/fc	7/fc	$\leq 0,2$
7	4,5	8/fc	4/fc	10/fc	0,6
8	4,5	8/fc	6/fc	7/fc	$\leq 0,3$
9	7,5	10/fc	5/fc	10/fc	0,6
10	7,5	10/fc	8/fc	7/fc	$\leq 0,2$
11	7,5	8/fc	4/fc	10/fc	0,6
12	7,5	8/fc	6/fc	7/fc	$\leq 0,3$

Table 9: Additional test conditions for a bit rate of fc/16

Condition	H (A/m)	t1	t2	t3	a
1	1,5	5/fc	3/fc	8/fc	0,6
2	1,5	4/fc	2/fc	6/fc	0,6
3	4,5	5/fc	3/fc	8/fc	0,6
4	4,5	4/fc	2/fc	6/fc	0,6
5	7,5	5/fc	3/fc	8/fc	0,6
6	7,5	4/fc	2/fc	6/fc	0,6

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Note:

For each data rate the corresponding table SHALL be taken into account. In addition, it is also necessary for data rates higher than $fc/128$ to implement more than a request command (REQB). For data rates higher than $fc/128$, several commands at $fc/128$ have to be executed before starting with higher data rate tests.

For data rates higher than $fc/128$, the sequence of test commands defined above has to be executed at the different magnetic field strengths, temperatures, and waveforms.

4.3.2 Type B

Test Description: The purpose of this test is to determine the communication stability versus field strength, modulation index, and rise and fall times according to ISO/IEC 14443-2 [R5] and ISO/IEC 10373-6 AM4 [R13] and AM5 [R14].

Test Setup: The following command sequence has to be executed once for each combination of parameters and each sample:

REQB → ATTRIB → TEST_COMMAND_SEQUENCE1

See for annex B for a list of possible test command sequences depending on the operation mode, e.g. plain text, BAC, AA, EAC.

Conditions: Minimum number of samples: 3
Parameters Temperature -10°C, RT, 50°C
Field strength 1.5 A/m, 4.5 A/m, 7.5 A/m
Data rate $fc/128$, $fc/64$, $fc/32$, $fc/16$

Report: The test report SHALL include the number of passed tests versus the total number of tests, a test description and the number of samples and the date.

Table 10: Data rate = $fc/128$, $fc/64$ and $fc/32$

Condition	H [A/m]	m [%]	t_r, t_f [μ s]	hr, hf ⁵ [%]
1	1.5	8	1	1.5
2	1.5	14	1	2.5
3	4.5	8	1	1.5
4	4.5	14	1	2.5
5	7.5	8	1	1.5
6	7.5	14	1	2.5

⁵ The values hr and hf are calculated with the following formulas: $hf = 20 m / (1 + m)$ [%];
 $hr = 20 m / (1 + m)$ [%].

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Table 11: Data rate = $f_c/16$

Condition	H [A/m]	m [%]	t_r, t_f [μ s]	hr, hf [%]
7	1.5	8	0,8	1.5
8	1.5	14	0,8	2.5
9	4.5	8	0,8	1.5
10	4.5	14	0,8	2.5
11	7.5	8	0,8	1.5
12	7.5	14	0,8	2.5

4.4 Resonance frequency test

Test Description: The purpose of this test is to determine the resonance frequency of the e-Passport. The resonance frequency SHALL be within the range that has been specified in the implementation conformance specification.

Test Setup: An LCR meter MAY be used: The magnetic field is generated by a coil connected to the device's output. The setup SHALL be calibrated in advance. The e-Passport coil SHALL be positioned in a close distance concentrically above the field generating coil.

The resonance frequency is defined as the frequency, where the real part of the field generating coil impedance reaches its maximum under threshold conditions of the e-Passport.

Conditions: Temperature: RT
Minimum number of samples: 3

Report: The test report SHALL state whether the resonance frequencies measured are within the specified range of resonance frequencies.

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5 Layer 3 timing and framing tests

5.1 Startup time

5.1.1 Type A

Test Description: Perform test as defined in ISO 10373-6 AM1, Annex G 3.2 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

The time between an RF field power-on and sending a REQA SHALL be 5 ms.

Conditions: Minimum number of samples: 3
Parameters: Data rates: fc/128
Temperature: -10, RT, 50°C
Field strength: 1.5 A/m, 4.5 A/m, 7.5 A/m

Report: The test report SHALL state whether the SCIC accepts a REQA 5ms after an REQB and 5ms after a power-on. The report SHALL include the number of the samples tested and the date.

5.1.2 Type B

Test Description: Perform test as defined in ISO 10373-6 AM1, Annex G 4.2 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

The time between an RF field power-on and sending a REQB SHALL be 5 ms.

Conditions: Minimum number of samples: 3
Parameters: Data rates: fc/128
Temperature: -10°C, RT, 50°C
Field strength: 1.5, 4.5, 7.5 A/m

Report: The test report SHALL state whether the SCIC accepts a REQB 5ms after an REQA and 5ms after a power-on. The report SHALL include the number of the samples tested and the date.

5.2 Frame delay time (type A only)

Test Description: This test SHALL check if the frame delay time (FDT) is correct over the operating field strength range. The purpose of this test is to determine the FDT of the e-Passport according to ISO 10373-6 AM1 [R11].

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Modifications done according:

- Reference ISO/IEC 14443-3 [R6], Frame delay time PCD to PICC
- Reference ISO/IEC 14443-3 AM1 [R9]

Perform test as defined in ISO 10373-6 AM1, Annex G 3.3 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

Conditions: Minimum number of samples: 3
Parameters: Data rates: fc/128
Temperature: -10, RT, 50°C
Field strength: 1.5, 4.5, 7.5 A/m

Report: The test report SHALL state whether the e-Passport meets the requirements concerning FDT timing for each combination of parameters.

Note:

If the last bit of the command is:

(1)b → FDT = 1236 / fc

(0)b → FDT = 1172 / fc

5.3 Start-Of-Frame- & End-Of-Frame-timing (type B only)

Test Description: The purpose of this test is to check whether or not the e-Passport meets the SOF and EOF timing requirements according to Annex G of [R11].

Perform test as defined in ISO 10373-6 AM1, Annex G 4.3 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

Conditions: Minimum number of samples: 3
Parameters: Data rates: fc/128
Temperature: -10 °C, RT, +50 °C
Field strength: 1.5, 4.5, 7.5 A/m

Report: The test report SHALL state whether the e-Passport meets the requirements concerning SOF and EOF timing for each combination of parameters.

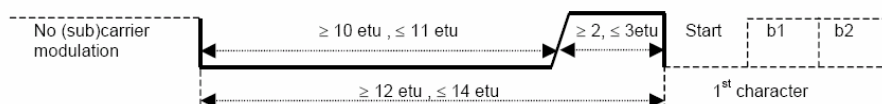


Figure 4: SOF

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Table 12: SOF timing

Condition	H [A/m]	SOF "0"	SOF "1"
1	1.5	10 etu	2 etu
2	1.5	11 etu	3 etu
3	4.5	10 etu	2 etu
4	4.5	11 etu	3 etu
5	7.5	10 etu	2 etu
6	7.5	11 etu	3 etu

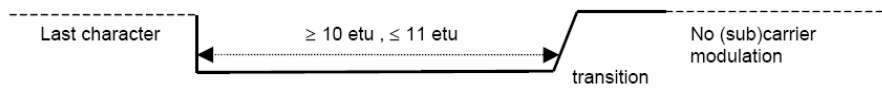


Figure 5: EOF

Table 13: EOF timing

Condition	H [A/m]	EOF
1	1.5	10 etu
2	1.5	11 etu
3	4.5	10 etu
4	4.5	11 etu
5	7.5	10 etu
6	7.5	11 etu

5.4 Extra guard time (EGT) (type B only)

Test Description: The purpose of this test is to check whether or not the e-Passport meets the EGT requirements according to [R6].

The EGT SCIC to PCD SHALL be between 0 and 2 etu. The EGT between 2 consecutive characters sent by the PCD to the SCIC SHALL be between 0 and 6 etu (not necessarily an integer number of etu).

Perform test as defined in ISO 10373-6 AM1, Annex G 4.3 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

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Conditions:	Minimum number of samples:	3
Parameters:	data rate:	fc/128
	Temperature:	-10 °C, RT, +50 °C
	Field strength:	1.5 A/m, 4.5 A/m, 7.5 A/m
Report:	The test report SHALL state whether the e-Passport meets the requirements concerning EGT timing for each combination of parameters.	

5.5 Timing before SCIC SOF (TR0 & TR1) (type B only)

Test Description: The purpose of this test is to check whether or not the e-Passport meets the TR0 and TR1 requirements according to [R6].

The maximum value of TR0 is 256/fs for ATQB only and $(256*16/fc)*2^{FW1}$ - TR1 for all other frames. The maximum value of TR1 is 200/fs.

Perform test as defined in ISO 10373-6 AM1, Annex G 6.3 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

Conditions:	Minimum number of samples:	3
Parameters:	data rate:	fc/128
	Temperature:	-10°C, RT, +50°C
	Field strength :	1.5, 4.5, 7.5 A/m
Report:	The test report SHALL state whether the e-Passport meets the requirements concerning TR0 and TR1 timing for each combination of parameters.	

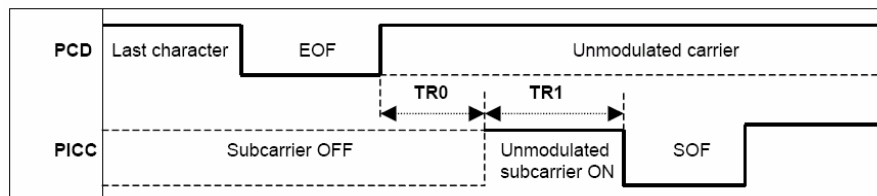


Figure 6: TR0 and TR1

5.6 Timing before SCIC to PCD EOF (TR2) (type B only)

Test Description: The purpose of this test is to check whether the e-Passport meets the TR2 requirements: $TR2_{MIN} = 400\mu s$.

Perform test as defined in ISO 10373-6 AM1, Annex G 6.3 [R11].

Test Setup: The ISO test setup has to be used as a PCD. The calibration of the field strength has to be done in advance. The e-Passport has to be placed in the ISO test setup. The field strength has to be readjusted.

Conditions:	Minimum number of samples:	3
Parameters:	data rate:	fc/128
	Temperature:	-10°C, RT, +50°C
	Field strength :	1.5, 4.5, 7.5 A/m

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Report: The test report SHALL state whether the e-Passport meets the requirements concerning TR2 timing for each combination of parameters.

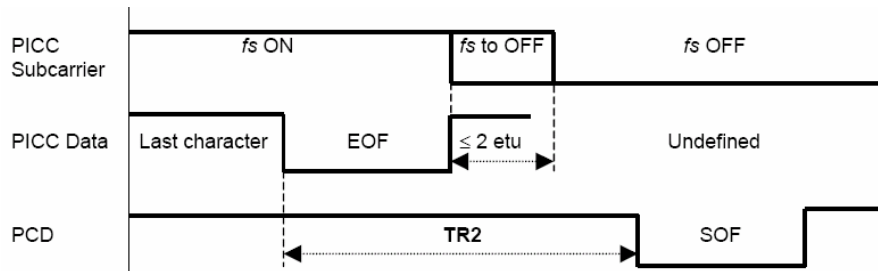


Figure 7: TR2

6 ISO layer 3 and 4 protocol tests

These tests provide a basic set of tests to be performed to check the compliance to ISO/IEC 14443 protocol layers 3 [R6] and 4 [R7]. All tests are based and SHALL be evaluated according to the referenced versions of standards.

Test Setup:

Setup as defined for the electrical tests can be used also for protocol tests. However, the test laboratory can select an alternative setup for the protocol related tests, as long as the specified parameters of the test signal can be met. Independent of the selected test setup, the setup is called "Test-Apparatus" in this clause.

The Test-apparatus SHALL be able to emulate the protocol, to measure and monitor the timing of the logical Input/Receive line relative to the CLK frequency, and to be able to analyze the I/O-bit stream in accordance with the protocol.

All tests SHALL be performed with one specific field strength between 1.5 A/m and 7.5 A/m if not further specified. All tests SHALL be performed at RT if not further specified.

The tests are based on the ISO/IEC10373-6 AM1 specification [R11]. For the test commands defined in [R11] commands that are typical for an application SHOULD be used. Therefore, refer to annex B for a list of TEST COMMANDS that MUST be used for testing the e-Passport.

6.1 Type A activation

These tests SHALL ensure that the start-up and the activation are in accordance with [R6]. These tests are split up to State Transitions and the handling of RATS and PPS.

6.1.1 Handling of type A anticollision

Test Description The purpose of this test is to check the correct behavior during anticollision as defined in [R6].

Perform test as defined in ISO 10373-6 AM1, Annex G 3.4 [R11]. The tests specified in the sub-clause "Handling of type A anticollision" of [R11] SHALL be used. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

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6.1.2 State transitions

Test Description	<p>The purpose of this test is to check the correct behavior during state transitions as defined in [R6].</p> <p>Perform test as defined in ISO 10373-6 AM1, Annex G 3.3 [R11]. The tests specified in the sub-clause “Testing of the PICC type A state transitions” of [R11] SHALL be used. The detailed test procedure is not further specified herein.</p>
Report	<p>The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11]. Additionally possible proprietary paths of the “Select sequence flow chart” specified in [R6] MUST NOT negatively affect the report.</p>

6.1.3 Handling of RATS

Test Description	<p>The purpose of this test is to check the correct behavior on RATS as defined in [R6].</p> <p>Perform test as defined in ISO 10373-6 AM1, Annex G 3.5 [R11]. The tests specified in the sub-clause “Handling of RATS” of [R11] SHALL be used where a valid and an invalid RATS is sent. The detailed test procedure is not further specified herein.</p> <p>In addition, it SHALL be verified if the data rates as defined in the interface byte TA(1) of the ATS are equal to the data rates claimed in the implementation conformance statement.</p>
Report	<p>The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11]. It SHALL state if the data rates are correctly encoded in the ATS.</p>

6.1.4 Handling of PPS

Test Description	<p>The purpose of this test is to check the correct behavior on PPS as defined in [R6].</p> <p>Perform test as defined in ISO 10373-6 AM1, Annex G 3.6 [R11]. The tests specified in the sub-clause “Handling of PPS request” of [R11] SHALL be used where a valid and an invalid PPS is sent. The detailed test procedure is not further specified herein.</p>
Report	<p>The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].</p>

6.1.5 Handling of FSD

Test Description	<p>The purpose of this test is to check if the SCIC correctly handles FSD negotiated by the RATS as defined in [R6].</p>
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Perform test as defined in ISO 10373-6 AM1, Annex G 3.7 [R11]. The tests specified in the sub-clause “Handling of FSD” of [R11] SHALL be used. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

6.2 Type B activation

The following tests regarding type B activation are required according to [R11] and SHALL ensure that the activation is in accordance with [R6].

6.2.1 Polling

Test Description: This test is to determine the behavior of a type B SCIC on receiving of REQB. Perform test as defined in ISO 10373-6 AM1, Annex G 4.2 [R11]. The procedure specified in “Test Method for Initialization of the PICC of Type B: Polling” of [R11] SHALL be used. The detailed test procedure is not further specified herein.

Report: The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

6.2.2 SCIC reception

Test Description: This test is to determine the behavior of a type B SCIC when receiving PCD messages. Perform test as defined in ISO 10373-6 AM1, Annex G 4.3 [R11]. The procedure specified in “Test Method for Initialization of the PICC of Type B: PICC Reception” of [R11] SHALL be used.⁶

Report: The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

6.2.3 State transitions

Test Description: These tests are to verify the correct implementation of a type B SCIC’s state machine. Perform test as defined in ISO 10373-6 AM1, Annex G 4.4 [R11]. The procedure specified in “Testing of the PICC Type B State Transition” of [R11] SHALL be used.

Report: The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

⁶ This test is already covered by tests described in 5.5 and 5.6. The tests here are restricted to the protocol layer and do not include timing aspects.

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6.2.4 Handling of type B anticollision

- Test Description:** This test is to determine the handling of a SCIC type B anticollision. Perform test as defined in ISO 10373-6 AM1, Annex G 4.5 [R11]. The procedure specified in “Handling of Type B Anticollision” of [R11] SHALL be used.
- Report:** The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

6.2.5 Handling of ATTRIB

- Test Description:** This test is to determine the behavior of the SCIC type B on ATTRIB command. Perform test as defined in ISO 10373-6 AM1, Annex G 4.6 [R11]. The procedure specified in “Handling of ATTRIB” of [R11] SHALL be used.
- In addition, it SHALL be verified if the data rates as defined in the protocol info byte of the ATQB are equal to the data rates claimed in the implementation conformance statement.
- Report:** The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11]. It SHALL state if the data rates are correctly encoded in the ATQB.

6.2.6 Handling of maximum frame size

- Test Description:** The purpose of this test is to check if the SCIC correctly handles FSD negotiated by the ATTRIB as defined in [R6]. Perform test as defined in ISO 10373-6 AM1, Annex G 4.7 [R11]. The procedure specified in “Handling of Maximum Frame Size” of [R11] SHALL be used.
- Report:** The test report SHALL state whether the SCIC responds as indicated in the procedures according to [R11].

6.3 Data exchange protocol tests

These tests SHALL ensure the logical operation is in accordance with [R7]. They are valid for both, type A and type B, whereas the activation before running these tests is different and listed below.

All tests SHALL be performed with one specific field strength between 1.5 A/m and 7.5 A/m if not further specified. All tests SHALL be performed at RT if not further specified.

The activation for type A SHALL be:

1. Activation using: REQA, ANTICOLLISSION, SELECT as defined in [R6]
2. Activation using: RATS as defined in [R7]
3. Check that activation has been correct (response has been correct for all commands)

The activation for type B SHALL be:

1. Activation using: REQB with number of timeslots set to 0 as defined in [R6]
2. Activation using: ATTRIB as defined in [R6]
3. Check that activation has been correct (response has been correct for all commands)

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6.3.1 Exchange of I-blocks

Test Description The purpose of this test is to check the correct behavior of I-blocks as defined in [R7].

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.2 [R11]. These tests include both correct and erroneous transactions and are described in [R7] and with the scenario caption “Exchange of I-blocks” in [R11]. The general TEST_COMMAND1 as defined by [R11] is specified in annex B. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

6.3.2 Chaining of I-blocks

Test Description The purpose of this test is to check the correct behavior of chained I-blocks as defined in [R7]. These tests are divided into two parts, the first one where the PCD (Test-apparatus) uses chaining and the second one where the e-Passport uses chaining.

The PCD chaining tests could be performed without knowing dedicated command behavior on the device under test. The purpose of this test is to check the correct behavior of chained I-blocks from PCD side as defined in [R7].

PCD uses chaining:

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.2 [R11]. These tests include both correct and erroneous transactions and are described in [R7] and with the scenario caption “PCD uses chaining” in [R11]. The general TEST_COMMAND1 as defined by [R11] is specified in annex B. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

Test Description: The SCIC chaining is harder to achieve. If the higher layer functionality is not known in detail (knowing a command which by default gets responded with a chained block), this test could not be performed. Therefore, this test is optional. If applicable, the general TEST_COMMAND2 as defined by [R11] is specified in annex B.

The purpose of this test is to check the correct behavior of chained I-blocks from SCIC side as defined in [R7].

SCIC uses chaining (optional):

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.2 [R11]. These tests include both correct and erroneous transactions and are described in [R7] and with the scenario caption “PICC uses chaining” in [R11]. The general TEST_COMMAND2 as defined by [R11] is specified in annex B.

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The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

6.3.3 DESELECT

Test Description The purpose of this test is to check the correct behavior of DESELECT as defined in [R7].

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.2 [R11]. These tests include both correct and erroneous transactions and are described in [R7] and with the scenario caption “DESELECT” in [R11]. The general TEST_COMMAND1 as defined by [R11] is specified in annex B. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

6.3.4 Request for waiting time extension (optional)

Test Description If the higher layer functionality is not known in detail (knowing a command which by default gets responded with a waiting time extension), this test could not be performed. Therefore, it is optional.

The purpose of this test is to check the correct behavior of request waiting time extension command as defined in [R7].

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.2 [R11]. These tests include both correct and erroneous transactions and are described in [R7] and with the scenario caption “Request for waiting time extension” in [R11]. The general TEST_COMMAND3 as defined by [R11] is specified in annex B which by default triggers responding with the waiting time extension command. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

6.3.5 Handling of SCIC error detection

Test Description The purpose of this test is to check the correct behavior of the SCIC’s error detection as defined in [R7].

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.3 [R11]. The general TEST_COMMAND1 and TEST_COMMAND3 as defined by [R11] are specified in annex B. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

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6.3.6 SCIC reaction on CID

Test Description The purpose of this test is to check the correct reaction of the SCIC to CID coding as defined in [R7]. This test can be applied to all e-Passports even if they do not support CID.

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.4 [R11]. The general TEST_COMMAND1, TEST_COMMAND2 and TEST_COMMAND3 as defined by [R11] are specified in annex B. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

6.3.7 SCIC reaction on NAD

Test Description The purpose of this test is to check the correct reaction of the SCIC to NAD coding as defined in [R7]. This test can be applied to all e-Passports even if they do not support NAD.

Perform tests as defined in ISO 10373-6 AM1, Annex G 5.5 [R11]. The general TEST_COMMAND1 and TEST_COMMAND2 as defined by [R11] are specified in annex B. The detailed test procedure is not further specified herein.

Report The test report SHALL state whether the response is in accordance with [R7]. The report SHALL include the test commands used.

Annex A Multiple chip reference detuning devices (informative)

A.1 Multiple SCIC's in e-Passports

Since the upcoming e-Passports MAY contain additional chips in the future, it has to be kept in mind that these additional elements will influence the tested electrical functionality. As the specification of further SCIC's has not been finished yet, the current ISO/IEC test specifications do not consider this issue.

However, since some of the effects of multiple chips in the e-Passport are already known, additional criteria SHOULD be studied in the future. This document specifies some additional criteria which are beyond the ISO/IEC specification but necessary for e-Passports to be prepared for multiple chip applications.

Annex A contains a proposal for a Multiple Chip Reference Detuning Device that can be used for a modified ISO test apparatus simulating the influence of multiple SCIC elements in the e-Passport. Because of the premature state of these additional applications, this proposed device will probably change as the standardization process continues. However, to increase the conformity of the e-Passport with future chip applications, this modified ISO test apparatus MAY optionally be used in the tests.

A.2 Purpose of multiple chip reference detuning devices

There are currently no standard specifications handling the issues because of the upcoming applications in e-Passports. This paragraph proposes a detuning device that can be used for a modified test setup.

All ISO Layer 2 tests described above SHOULD additionally be performed with a multiple chip reference detuning device. These additional tests include stronger requirements with respect of the use of up to 4 SCIC's, which will have a higher coupling factor in comparison with the e-Passport itself. The handling will be described in detail afterwards.

Tuning of the field strength SHALL only be done with the e-Passport itself, no retuning with the multiple chip reference detuning devices SHALL be done. In all configurations the e-Passport SHALL fulfill the requirements.

In order to use multiple chip reference detuning devices with the test equipment, it is necessary to modify the test apparatus to have an additional pick up coil. The schematic of these devices are based on the Power Reference SCIC defined in [R10], Annex D, with modified antenna size, resonance frequency and power consumption. Description and figures are given hereafter.

The tests SHALL be performed starting with no jumper set, then adding one jumper after each other until all four jumpers are set. The test SHALL be performed for all five states and the behavior SHALL be the expected one. The behavior of the device under test SHALL be stated in the report.

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A.3 Definition and description of test setup

A.3.1 Schematic and components

Table 14: Circuit diagrams

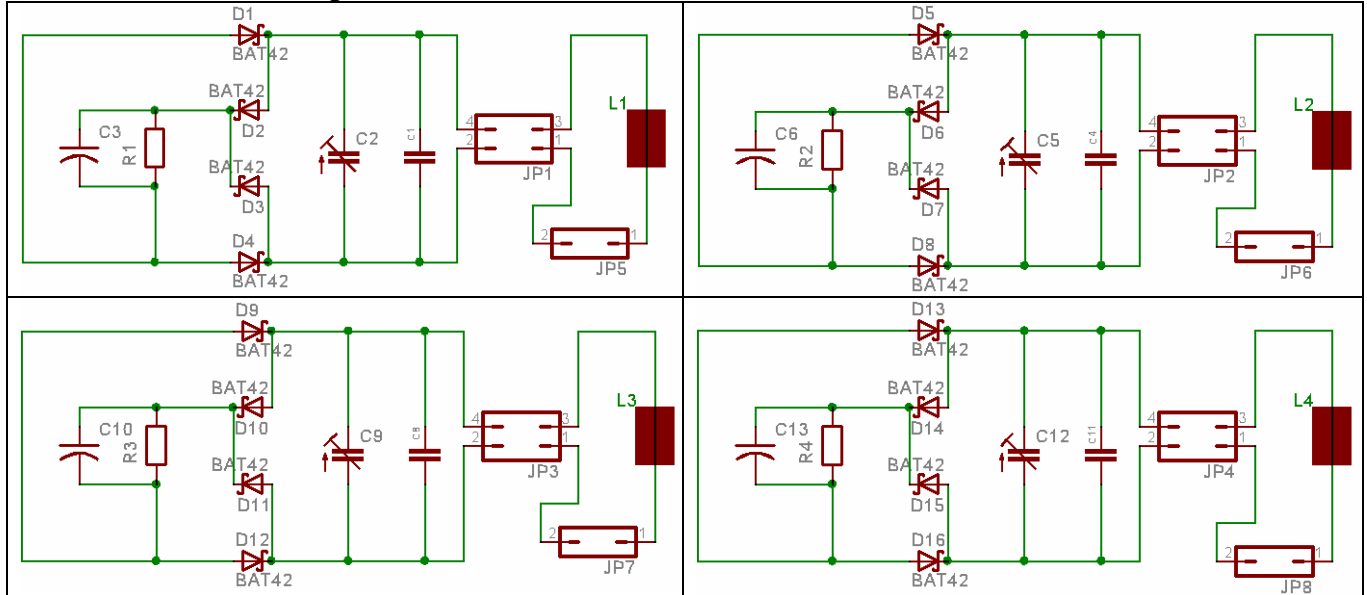


Table 15: Components used

Components	Value
L1, L2, L3, L4 (coil)	Description see below
C1, C4, C8, C11	15pF SMD capacitor (Stray capacity of coil <5pF)
C2, C5, C9, C12	2 – 20pF
C3, C6, C10, C13	10nF
D1 – D16	BAR 43 or equivalent
R1, R2, R3, R4	1,8kOhm
JP1, JP2, JP3, JP4	Dual Jumper
JP5, JP6, JP7, JP8	Single Jumper

A.3.1.1 Coil characteristics

A four layer PCB SHALL be used. At each layer a coil SHALL be placed, see drawing below. The coil in the active area of the Reference SCIC SHALL have 3 turns and SHALL be concentric with the area outline.

The outer size of the coils SHALL be 85.7 mm - 68 mm with a relative tolerance of +- 2 %. The coil SHALL be printed on PCB plated with a thickness of 35 µm copper. Track width and spacing SHALL be 635 µm with a relative tolerance of +- 10 %. The radius of the corners SHALL be 1.27mm, 0.95mm and 0.63mm responding to the 3 turns.

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A.3.1.2 Resonance frequency

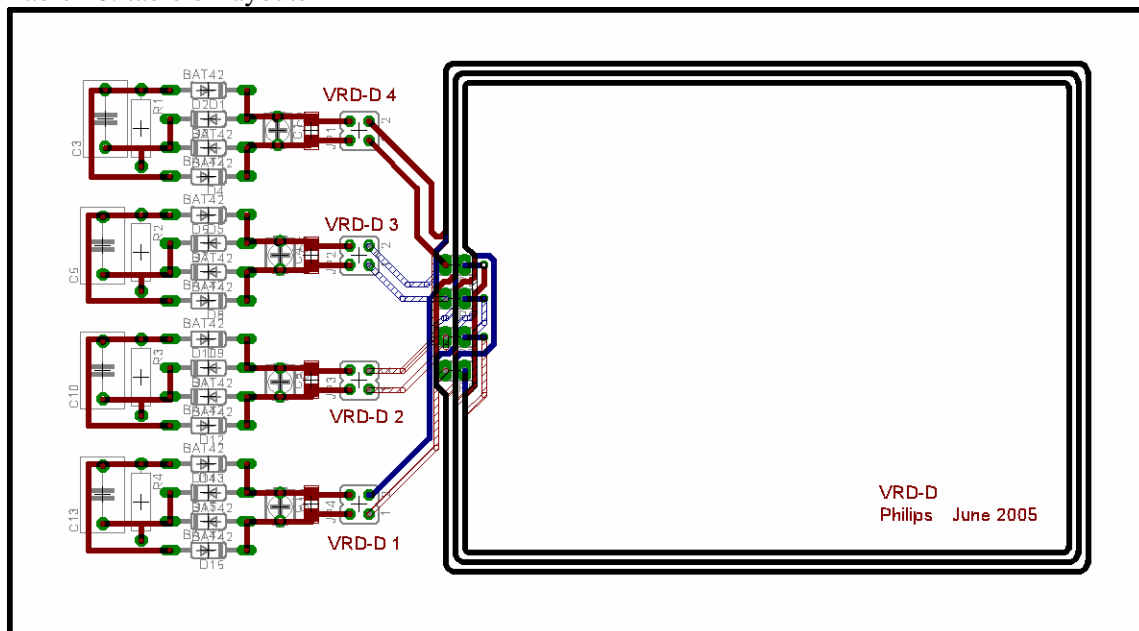
Modification done according:

- Reference document ISO/IEC 10373-6 AMD4 [R13], PICC resonance frequency

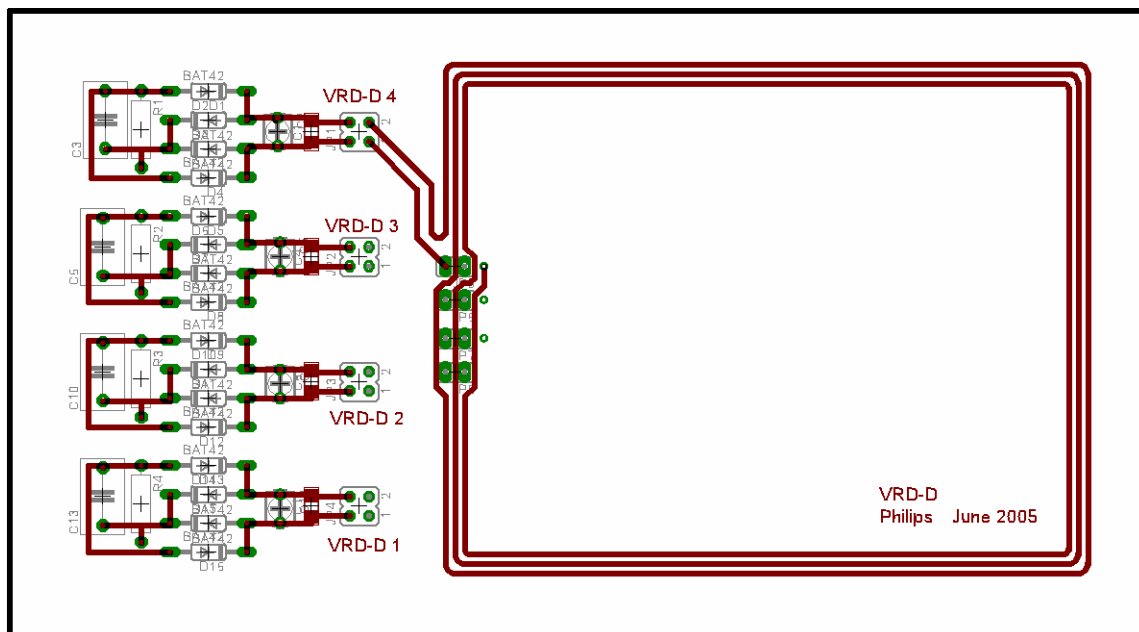
The tuning of the resonance frequency has to be done for each multiple chip reference detuning device, by setting only the jumper corresponding to the coil to be tuned. All other jumpers have to be removed. Then the resonance of each device SHALL be tuned to 22.5MHz.

A.3.2 Layout

Table 16: table of layouts



All Layers

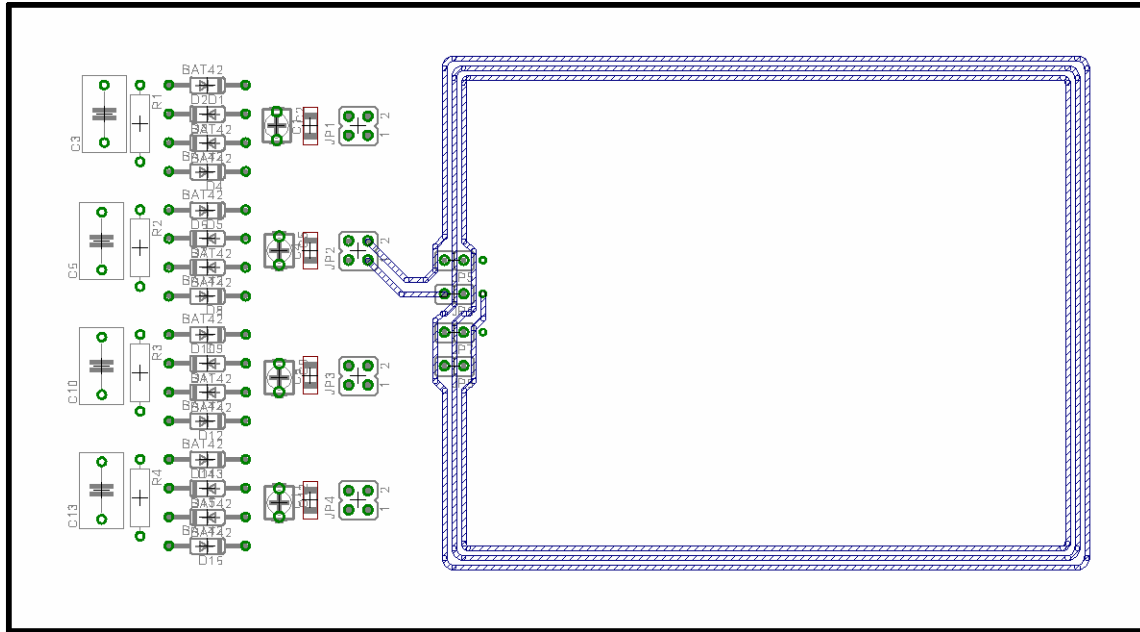


Top Layer

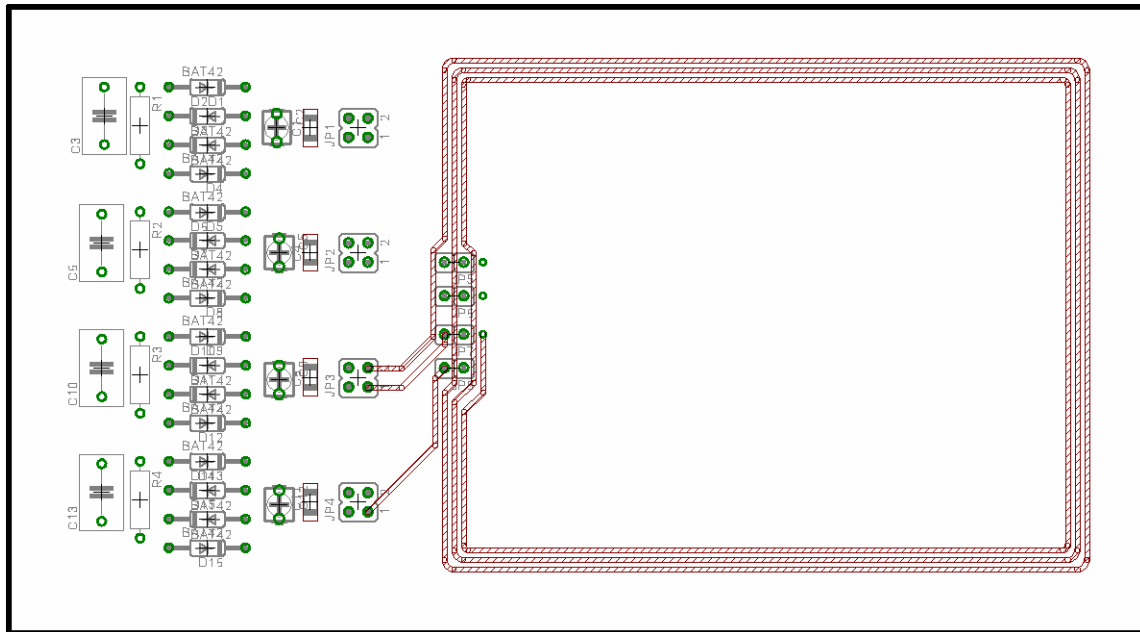
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2nd Layer

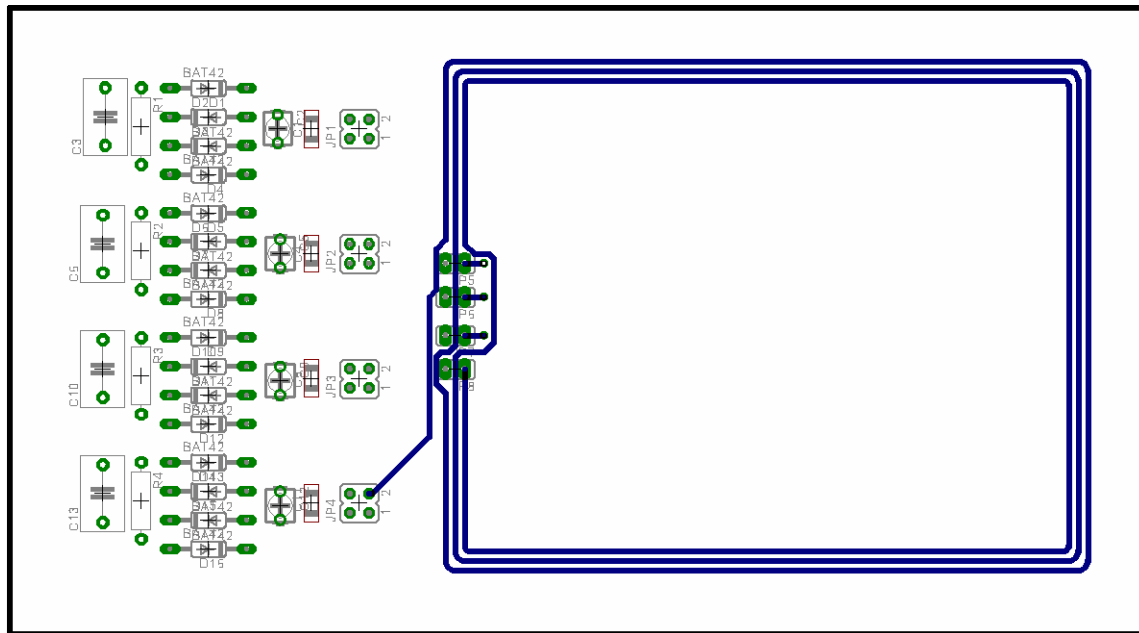


3rd Layer

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Bottom Layer

A.3.3 Change of “Assembly of Test PCD”

The sense coils (sense coil a and b) and the PCD antenna SHALL be assembled parallel and with the antenna and sense coils coaxial to each other and such that the distance between the active conductors is 37,5 mm as illustrated in the figure below. The distance between the coil in the DUT and the calibration coil SHALL be equal with respect to the coil of the test PCD antenna. Additionally the multiple chip reference detuning device SHALL be placed centrally and close to the DUT with a maximum of 1mm space in between. The pickup for the e-Passport SHALL give the possibility to center the DUT antenna centrally to the sense coil.

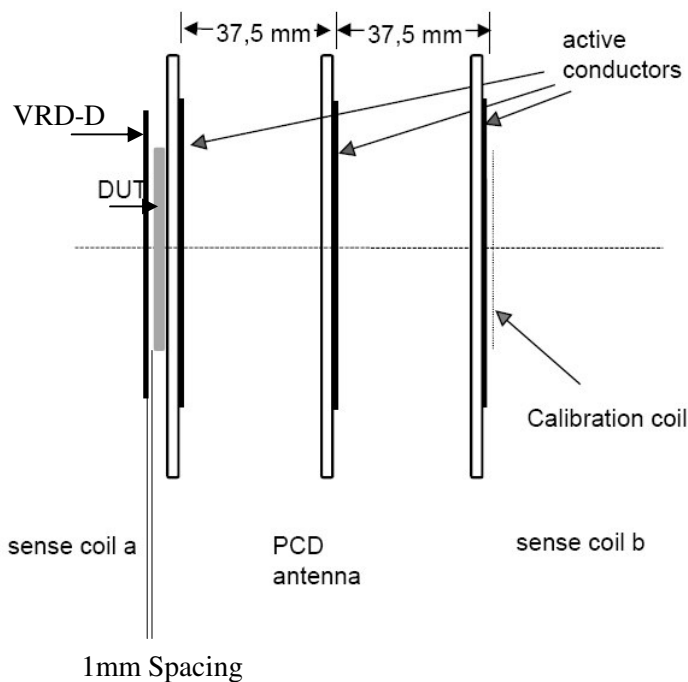


Figure 8: Modified test assembly

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Note:

Multiple Chip Reference Detuning Devices are not defined in the current standards. Therefore these tests SHOULD be performed additionally. The results from these tests MAY be interpreted differently to the ones without this setup.

Unless a test for the influence between e-Passport and additional SCIC's is defined, the Multiple Chip Reference Detuning Device tests are optional.

The size of an additional SCIC is currently not fixed. If the size of an additional SCIC is defined, this MAY have an impact on this test setup.

A.4 Threshold resonance frequency test

This test is provided to test the conformity of the test object to future additional SCIC's (see A.1).

Modifications done according:

- Reference document ISO/IEC 10373-6 AM4 [R13], PICC resonance frequency

Test Description: The purpose of this test is to determine the resonance frequency of the e-Passport. The resonance frequency SHALL be within 15 MHz and 18 MHz.

Test Setup: An LCR meter may be used: The magnetic field is generated by a coil connected to the device's output. The setup has to be calibrated in advance. The e-Passport coil has to be positioned in a close distance concentrically above the field generating coil.

The resonance frequency is defined as the frequency, where the real part of the field generating coil impedance reaches its maximum under threshold conditions of the e-Passport.

Conditions: Temperature: RT
Minimum number of samples: 3

Report: The test report SHALL include the mean value μ and the standard deviation σ of the resonance frequency.

Annex B Annex B – List of test command sequences (normative)

B.1 General

This annex contains sequences of test commands on the application level that are employed in several test cases defined in this technical report, e.g. chaining in the frame protocol layer. Since the ISO 10373-6 AM1 test standard [R11] does only define generic test commands, this technical report provides mandatory test commands that are specific to the e-Passport's LDS application and its variants.

B.2 Test commands for e-Passports without access control (plain)

Identifier

TEST_COMMAND_SEQUENCE1

References

- Operating Field Strength Test, chapter 4.2
- Communication Stability Test, chapter 4.3

Preconditions

- RATS and PPS / ATTRIB are successfully performed

APDU definition

Sequence	Command	C-APDU
1	SELECT	00 A4 04 0C 07 A0 00 00 02 47 10 01
3	READ BINARY	00 B0 81 00 00

Identifier

TEST_COMMAND1

References

- Exchange of I-blocks, chapter 6.3.1
- Chaining of I-blocks, chapter 6.3.2
- DESELECT, chapter 6.3.3

Preconditions

- RATS and PPS / ATTRIB are successfully performed

APDU definition

Sequence	Command	C-APDU
1	SELECT	00 A4 04 0C 0C A0 00 00 02 47 10 01 00 00 00 00 00 ⁷

⁷ This command will not be processed successfully by the application but it can be used for PCD chaining.

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Identifier

TEST_COMMAND2

References

- Chaining of I-blocks, chapter 6.3.2

Preconditions

- RATS and PPS / ATTRIB are successfully performed
- LDS application "A0 00 00 02 47 10 01" is successfully selected

APDU definition

Sequence	Command	C-APDU
1	READ BINARY	00 B0 82 00 00

Identifier

TEST_COMMAND3

References

- Request for waiting time extension (optional), chapter 6.3.4

Preconditions

- To be defined by applicant.

APDU definition

- To be defined by applicant.

B.3 Test commands for e-Passport with BAC

Identifier

TEST_COMMAND_SEQUENCE1

References

- Operating Field Strength Test, chapter 4.2
- Communication Stability Test, chapter 4.3

Preconditions

- RATS and PPS / ATTRIB are successfully performed

APDU definition⁸

Sequence	Command	C-APDU
1	SELECT	00 A4 04 0C 07 A0 00 00 02 47 10 01
2	GET CHALLENGE	00 84 00 00 08
2	MUTUAL AUTHENTICATE	00 82 00 00 28 <authentication token> 28
3	READ BINARY	0C B0 81 00 xx 97 01 00 8E 08 <mac> 00

⁸ Apply basic access control as defined in [R2]

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Identifier

TEST_COMMAND1

References

- Exchange of I-blocks, chapter 6.3.1
- Chaining of I-blocks, chapter 6.3.2
- DESELECT, chapter 6.3.3

Preconditions

- RATS and PPS / ATTRIB are successfully performed

APDU definition

Sequence	Command	C-APDU
1	SELECT	00 A4 04 0C 0C A0 00 00 02 47 10 01 00 00 00 00 00 ⁹

Identifier

TEST_COMMAND2

References

- Chaining of I-blocks, chapter 6.3.2

Preconditions

- RATS and PPS / ATTRIB are successfully performed
- LDS application “A0 00 00 02 47 10 01” is successfully selected
- Basic access control is granted

APDU definition

Sequence	Command	C-APDU
1	READ BINARY	0C B0 82 00 xx 97 01 00 8E 08 <mac> 00

Identifier

TEST_COMMAND3

References

- Request for waiting time extension (optional), chapter 6.3.4

Preconditions

- To be defined by applicant.

APDU definition

- To be defined by applicant.

⁹ This command will not be processed successfully by the application but it can be used for PCD chaining.

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B.4 Test commands for e-Passport with AA

Identifier

TEST_COMMAND_SEQUENCE1

References

- Operating Field Strength Test, chapter 4.2
- Communication Stability Test, chapter 4.3

Preconditions

- RATS and PPS / ATTRIB are successfully performed

APDU definition

Sequence	Command	C-APDU
1	SELECT	00 A4 04 0C 07 A0 00 00 02 47 10 01
3	INTERNAL AUTHENTICATE	00 88 00 00 08 F1 73 58 99 74 BF 40 C6 00

Identifier

TEST_COMMAND1

References

- Exchange of I-blocks, chapter 6.3.1
- Chaining of I-blocks, chapter 6.3.2
- DESELECT, chapter 6.3.3

Preconditions

- RATS and PPS / ATTRIB are successfully performed

APDU definition

Sequence	Command	C-APDU
1	SELECT	00 A4 04 0C 0C A0 00 00 02 47 10 01 00 00 00 00 00 ¹⁰

Identifier

TEST_COMMAND2

References

- Chaining of I-blocks, chapter 6.3.2

Preconditions

- RATS and PPS / ATTRIB are successfully performed
- LDS application "A0 00 00 02 47 10 01" is successfully selected

APDU definition

Sequence	Command	C-APDU
1	INTERNAL AUTHENTICATE	00 88 00 00 08 F1 73 58 99 74 BF 40 C6 00

¹⁰ This command will not be processed successfully by the application but it can be used for PCD chaining.

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Identifier

TEST_COMMAND3

References

- Request for waiting time extension (optional), chapter 6.3.4

Preconditions

- To be defined by applicant.

APDU definition

- To be defined by applicant.

Annex C Annex C – Functionality check test (informative)

C.1 General

For destructive tests such as mechanical and electrical (layer 1) stress tests, it is often required to check if the e-Passport “operates as intended”. These tests are not further defined by the ISO standards, and thus they are left to the responsibility of the test laboratories.

Since there MAY be different requirements for performing functionality check tests, this annex specifies two optional tests to verify the e-Passports functionality on the electrical and on the application level without performing all these, sometimes time-consuming tests specified in this technical report.

On the electrical level, the functionality check tests require specialized equipment and MAY only be performed by test laboratories that have the necessary skills and equipment, whereas the application functionality check test MAY be performed with standard equipment.

C.2 Application functionality check test

Test Description: This test is a basic functionality check test. The purpose of this test is to check if the e-Passport’s mandatory LDS application data as specified in [R1] can be retrieved from the SCIC. It has to be verified that this information has not been altered by the destructive tests.

The test procedure SHOULD be performed with all given samples as follows:

1. Put the e-Passport on the contactless reader of the tests setup.
2. Select the e-Passport’s SCIC using the initialization and anticollision procedure defined in [R6].
3. Select the LDS application as specified in [R1].
4. Perform basic access control as specified in [R2] if indicated in the implementation conformance statement.
5. Read data of file EF.COM as specified in [R1].
6. Read data of file EF.DG1 as specified in [R1].
7. Read data of file EF.DG2 as specified in [R1].
8. Read the document security object of file EF.SOD as specified in [R1].
9. Verify the digital signature contained in the document security object as specified in [R2].

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Test Setup: The test MAY be performed with standard PC/SC readers and any software that is able to send commands to the e-Passport and that can verify the integrity of the data retrieved.

Report: The test report SHALL state whether the defined LDS application data can be retrieved and whether it has been altered.

C.3 Electrical functionality check test

Test Description: The purpose of this test is to check the electrical functionality of the e-Passport and MAY be used in addition to the Application functionality check test specified in chapter C.2.

The test procedure SHOULD be performed with all given samples as follows:

1. Apply the Resonance Frequency Test as specified in chapter 4.4.
2. Apply the Operating Field Strength Test as specified in chapter 4.2.

Test Setup: For this test, the test setup defined in the corresponding chapters SHALL be used.

Report: The test report SHALL state whether the resonance frequency is in the range specified in the implementation conformance statement and whether the e-Passport operates as intended for all combinations of temperatures and field strengths, see chapter 4.2.