INTERNATIONAL STANDARD

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Test methods for machine readable travel documents (MRTD) and associated devices —

Part 2: Test methods for the contactless interface

Méthodes d'essai pour les documents de voyage lisibles par machine (MRTD) et dispositifs associés —

Partie 2: Méthodes d'essai de l'interface sans contact

Reference number
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Contents

Page

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by ISO/IEC JTC 1, *Information technology*, SC 17, *Cards and security devices for personal identification*.

This second edition cancels and replaces the first edition (ISO/IEC 18745-2:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

— simplification of the test conditions for PCD in terms of temperature;

— modification of the loading effect required for eMRTD.

A list of all parts in the ISO/IEC 18745 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document represents a necessary step in a process designed to ensure contactless communications interoperability between inspection systems and machine-readable travel documents to be accepted by them. The purpose of this document is to provide the conformance test plan that needs to be performed to ensure conformity of inspection systems and any machine-readable travel documents in accordance with ICAO Doc 9303.

This conformance test plan is not designed to repeat or duplicate the referenced specifications and associated test method [essentially ISO/IEC 14443 (all parts) and ISO/IEC 10373-6] but to list the test conditions to be performed in addition to the ones already described in the ISO/IEC 10373-6 and to define their testing and use conditions.

Test methods for machine readable travel documents (MRTD) and associated devices —

Part 2:
Test methods for the contactless interface

1 Scope

This document defines the conformance test plan, based on ISO/IEC 10373-6, for the contactless interface of eMRTDs and eMRTD associated readers compliant with ICAO Doc 9303.

Application requirements for eMRTD and eMRTD reader are outside of the scope of this document and are defined in ICAO Doc 9303-10.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 10373-6:2016[1)], *Identification cards — Test methods — Part 6: Proximity cards*

ISO/IEC 10373-6:2016/Amd.3:2018[1)], *Identification cards — Test methods — Part 6: Proximity cards, AMENDMENT 3: PICC loading effect*

ISO/IEC 14443-1:2018[1)], *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 1: Physical characteristics*

ISO/IEC 14443-2, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*[1)]

ISO/IEC 14443-3, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 3: Initialization and anticollision*[1)]

ISO/IEC 14443-4:2018[1], *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol*

Doc ICAO 9303-2, *Machine Readable Travel Documents, Eighth Edition — Part 2: Specifications for the Security of the Design, Manufacture and Issuance of MRTDs*

Doc ICAO 9303-9, *Machine Readable Travel Documents, Eighth Edition — Part 9: Deployment of Biometric Identification and Electronic Storage of Data in MRTDs*

Doc ICAO 9303-10, *Machine Readable Travel Documents, Eighth Edition — Part 10: Logical Data Structure (LDS) for Storage of Biometrics and Other Data in the Contactless Integrated Circuit (IC)*

Doc ICAO 9303-11, M*achine Readable Travel Documents, Eighth Edition — Part 11: Security Mechanisms for MRTDs*

1) When ISO/IEC 10373-6 or ISO/IEC 14443 (all parts) are referred to, PICC represents the eMRTD and PCD represents eMRTD associated reader.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
test method
method for testing the characteristics of eMRTDs and eMRTD associated readers for the purpose of assessing their conformance with International Standards

3.2
sample
piece of the total number of eMRTDs or eMRTD associated readers required and presented for testing according to this document

3.3
PICC
eMRTD object

3.4
PCD
eMRTD associated reader

4 Symbols and abbreviated terms

For the purposes of this document, the following abbreviations apply.

AA	active authentication
BAC	basic access control
CVCA	country verifying certification authority
DUT	device under test
DV	document verifier
EAC	extended access control (throughout this document, the term EAC refers to EAC v1)
eMRTD	electronic machine-readable travel document
f_c	frequency of operating field as defined in ISO/IEC 14443-2
f_s	frequency of subcarrier as defined in ISO/IEC 14443-2
H_{min}	minimum field strength as defined in ISO/IEC 14443-2
H_{max}	maximum field strength as defined in ISO/IEC 14443-2
IS	inspection system
LDS	logical data structure
PACE	password authenticated connection establishment

"XY"	hexadecimal notation, equal to XY in base 16
REQA	REQuest command, Type A as defined in ISO/IEC 14443-3
REQB	REQuest command, Type B as defined in ISO/IEC 14443-3
$t_{E,PCD}$	low EMD time, PCD as defined in ISO/IEC 14443-3
$V_{E,PCD}$	EMD limit, PCD as defined in ISO/IEC 14443-2

5 Test methods for eMRTD

5.1 General test conditions

5.1.1 General

Test conditions and procedures in this clause are based on ISO/IEC 10373-6 taking into account specific needs of eMRTD application.

This clause addresses the test of the mandatory and optional features of eMRTD's contactless interface.

5.1.2 to 5.1.5 specify the different test setups, the values used for the tests, and a recommendation for the format of the test report.

Depending on the implementation statement of the applicant, Type A or Type B tests shall be performed.

All the tests defined in this document and relevant to eMRTD are applied in accordance to PICC Class 1.

For tests of ISO/IEC 14443-1 and ISO/IEC 14443-2 parameters, the minimum number of samples provided for testing is three, unless explicitly defined otherwise. The applicant may request that a larger number of samples be tested. The samples provided by the applicant shall be personalized and should be marked each with a unique serial number.

It is not mandatory to use the same samples to run all the tests defined in this document. It's recommended to provide to the test laboratory at least:

— 3 samples for static electricity test;

— 3 samples for alternating magnetic field test;

— 3 samples for ISO/IEC 14443-2 parameters;

— 1 sample for ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters.

5.1.2 Test environment

Unless otherwise specified, testing shall take place at room temperature 23 °C ± 3 °C (73 °F ± 5 °F) and in an environment of relative humidity 25 % to 75 %.

5.1.3 Test conditions for PICC

Unless otherwise specified, the test conditions defined in Table 1 shall be applied.

Table 1 — Test conditions for PICC

Conditions	Temperature	Values
Field strength	At room temperature and -10 °C	1,5 A/m, 2,5 A/m, 3,5 A/m, 4,5 A/m and 7,5 A/m[a]
	At + 50 °C	1,5 A/m, 2,5 A/m, 3,5 A/m, 4,5 A/m and 6,0 A/m[b]
[a] Optional values 5,5 A/m and 6,5 A/m may be applied in addition.		
[b] Optional value 5,5 A/m may be applied in addition.		

NOTE Optional and mandatory field strength values are chosen in line with the following reasons:

— most of eMRTD associated readers operate between 1,5 A/m(rms) and 4,5 A/m(rms);

— check that there is no potential communication hole between 1,5 A/m(rms) and 4,5 A/m(rms) or more.

Unless otherwise specified, the values defined in Table 2 shall be used to adjust PICC-test-apparatus parameters.

Table 2 — Values of the PICC-test-apparatus parameters unless otherwise specified

Parameter	Value	To be applied to
Parameters applicable for all bit rates		
FSDI	8	Type A
Start Of Frame (SOF) timing	10 etu "0" followed by 2 etu "1"	Type B
End Of Frame (EOF) timing	10 etu "0"	Type B
Extra Guard Time (EGT) timing	0 etu	Type B
Maximum Frame Size Code in ATTRIB	8	Type B
Parameters applicable for PCD to PICC bit rate $f_c/128$		
PCD field envelope during 60 % of t_2	0,5 %	Type A
t_1	$40/f_c$	Type A
t_2	$7/f_c$	Type A
t_3	$12/f_c$	Type A
t_4	$6/f_c$	Type A
Overshoot	0 %	Type A and Type B
Modulation index m	12 %	Type B
Rise time, t_r, fall time, t_f	$12/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/64$ (optional)		
a	0,1	Type A
t_1	$18/f_c$	Type A
t_5	$15/f_c$	Type A
t_6	$9/f_c$	Type A
Overshoot	0	Type A and Type B
Modulation index m	12 %	Type B
Rise time t_r, fall time t_f	$10/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/32$		
a	0,2	Type A
t_1	$9/f_c$	Type A
t_5	$7/f_c$	Type A
t_6	$8/f_c$	Type A
Overshoot	0	Type A and Type B

Table 2 *(continued)*

Parameter	Value	To be applied to
Modulation index m	12 %	Type B
Rise time t_r, fall time t_f	$8/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/16$ (Optional)		
a	0,4	Type A
t_1	$5/f_c$	Type A
t_5	$4/f_c$	Type A
t_6	$5/f_c$	Type A
Overshoot	0	Type A and Type B
Modulation index m	12 %	Type B
Rise time t_r, fall time t_f	$6/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/8$ (Optional)		
Overshoot	0	Type A and Type B
Modulation index m	8 % for short modulation pulses	Type A and Type B
Rise time t_r, fall time t_f	$5/f_c$	Type A and Type B
Parameters applicable for PCD to PICC bit rate $f_c/4$ (Optional)		
Overshoot	0	Type A and Type B
Modulation index m	8 % for short modulation pulses	Type A and Type B
Rise time t_r, fall time t_f	$4/f_c$	Type A and Type B
Parameters applicable for PCD to PICC bit rate $f_c/2$ (Optional)		
Overshoot	0	Type A and Type B
Modulation index m	8 % for short modulation pulses	Type A and Type B
Rise time t_r, fall time t_f	$2/f_c$	Type A and Type B
Parameters applicable for PCD to PICC bit rate $3f_c/4$ and $3f_c/2$ (Optional)		
PR	56°	Type A and Type B
ISI_d	0	Type A and Type B
ISI_m	1	Type A and Type B
Phase noise	0,03	Type A and Type B
Parameters applicable for PCD to PICC bit rate f_c and $2f_c$ (Optional)		
PR	60°	Type A and Type B
ISI_d	0	Type A and Type B
ISI_m	1	Type A and Type B
Phase noise	0,012 5	Type A and Type B

5.1.4 Applicant information

In order to set up the tests properly, the information specified in Table 3 shall be known by the laboratory. The information not accessible to the laboratory from the sample itself shall be provided by the applicant.

Table 3 — Applicant information on eMRTD product

Product characteristic	Standard reference	Applicant declaration
Physical size of product	ICAO Doc 9303-2	TD1/TD2/TD3
Location of antenna within eMRTD	ICAO Doc 9303-10, B.1	Data page/Centre of booklet/Cover/ Separate sewn-in page/Back cover
PICC class 1[a]	ICAO Doc 9303-10, B.1	YES/NO
Shielding of eMRTD	ICAO Doc 9303-10, B.7	YES/NO If yes, precise where shielding is applied
(Optional) eMRTD resonance frequency range[b]	ICAO Doc 9303-10, B.9	Minimum and maximum resonance frequency in MHz
Communication signal interface	ICAO Doc 9303-10, B.9	Type A/Type B
Random or fixed UID (Type A) or PUPI (Type B)	ICAO Doc 9303-10, B.8	Fixed / Random
(Optional) PCD to PICC supported bit rates	ICAO Doc 9303-10, B.4	List of supported optional PCD to PICC bit rates
(Optional) PICC to PCD supported bit rates	ICAO Doc 9303-10, B.4	List of supported optional PICC to PCD bit rates
(Optional) Support of exchange of additional parameters	ICAO Doc 9303-10, B.6	YES/NO
(Optional) Frames with error corrections supported	ICAO Doc 9303-10, B.6	YES/NO
Maximum frame size supported	ICAO Doc 9303-10, B.10	Declare the maximum frame size integer in reception supported by the eMRTD
Frame waiting time integer	ICAO Doc 9303-10, B.11	Declare the frame waiting time integer supported by the eMRTD
Supported access control[c]	ICAO Doc 9303-11	BAC: YES/NO PACE: YES/NO EAC: YES/NO
Active authentication supported	ICAO Doc 9303-11	YES/NO[d]

[a] If PICC Class 1 is claimed, the Class 1 verification test is performed.

[b] If the range is provided, the optional resonance frequency test is performed.

[c] Information required to perform authentication is provided by the applicant (machine readable zone (MRZ), EAC certificates chain with IS private key, static/dynamic binding). If no access control is selected by the applicant, eMRTD supports plaintext access. If PACE is supported, PACE is applied during operating field strength test. If EAC is supported, EAC is applied during operating field strength test in addition to BAC or PACE.

[d] If supported, active authentication is applied during operating field strength.

5.1.5 Test 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 shall be included.

For all functionality check tests, the report shall state what tools and methods have been used to verify the functionality of the eMRTD.

The test report shall include the information on eMRTD product as defined in 5.1.4.

5.2 Test of ISO/IEC 14443-1 parameters

5.2.1 Antenna size and PICC Class 1 verification (optional)

5.2.1.1 Purpose

The purpose of this test is to check if the physical coil dimensions meet the requirements according to ISO/IEC 14443-1.

This test is optional and shall be applied if the applicant claims compliance with “Class 1” in Table 3.

5.2.1.2 Test procedure

Determine on 3 separate samples whether the eMRTD antenna is within the PICC antenna zone as described in ISO/IEC 14443-1:2018, A.1.1. The applied method is under responsibility of test laboratory.

5.2.1.3 Test report

The test report shall state whether the coil geometry of the antenna is in accordance with PICC Class 1 definition.

5.2.2 Static electricity

5.2.2.1 Purpose

See ISO/IEC 10373-6:2016, 6.2.2.

5.2.2.2 Test procedure

Apply ISO/IEC 10373-6:2016, 6.2.2 on 3 separate samples.

The discharge value is selected according to ISO/IEC 7810:2019, 9.3.2.

In case the physical size of the eMRTD is different from ID-1, the test procedure shall be applied at the centre of a two-dimensional 1 cm × 1 cm mesh placed over the DUT.

5.2.2.3 Test report

The test report shall state whether or not the eMRTDs operate as described in 5.6 after the applied test procedure.

5.2.3 Alternating magnetic field

5.2.3.1 Purpose

See ISO/IEC 10373-6:2016, 6.2.1.

5.2.3.2 Test procedure

Apply ISO/IEC 10373-6:2016, 6.2.1 on 3 separate samples.

5.2.3.3 Test report

The test report shall state whether or not the eMRTDs operate as described in 5.6 after the applied test procedure.

5.3 Test of ISO/IEC 14443-2 parameters

5.3.1 eMRTD transmission

5.3.1.1 Purpose

See ISO/IEC 10373-6:2016, 7.2.1.1.

5.3.1.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.2.1 on 3 separate samples under the following conditions:

— at temperature –10 °C, room temperature and +50 °C.

Any PCD to PICC bit rate may be used. For a PICC to PCD bit rate of $f_c/128$, REQA or REQB shall be used. For a supported PICC to PCD bit rates higher than $f_c/128$ except bit rates of $f_c/64$, $f_c/32$ and $f_c/16$, TEST_COMMAND1 after appropriate PICC to PCD bit rate selection shall be used.

5.3.1.3 Test report

The test report shall give the load modulation amplitudes of the upper and lower sidebands at $f_c + f_s$ and $f_c - f_s$ and the applied fields strengths and modulations.

5.3.2 Operating field strength

5.3.2.1 Purpose

The purpose of this test is to check if the eMRTD operates its application within the operating field strength range defined in ISO/IEC 14443-2.

5.3.2.2 Test procedure

For this procedure, the test PCD assembly shall be used as the eMRTD associated reader antenna. The eMRTD under test shall be placed in the DUT position, concentric with sense coil a. The field strength into the test PCD assembly antenna shall be readjusted to the required field strength.

The following command sequence shall be used for this procedure:

For Type A:

a) REQA command;

b) repeat ANTICOLLISION and SELECT commands until UID is complete;

c) RATS command;

d) TEST_COMMAND_SEQUENCE1.

For Type B:

a) REQB command;

b) ATTRIB command;

c) TEST_COMMAND_SEQUENCE1.

Any PICC to PCD bit rate may be used. TEST_COMMAND_SEQUENCE1 shall be sent after appropriate PCD to PICC bit rate selection. TEST_COMMAND_SEQUENCE1 is specified in 5.5 depending on the access control mechanism declared in Table 3.

Execute the commands sequence on 3 separate samples under the following conditions:

— every supported PCD to PICC bitrate;

— at temperature –10 °C, room temperature and +50 °C.

5.3.2.3 Test report

The test report shall confirm the intended operation at the supported PCD to PICC bit rates. Used test conditions shall be mentioned in the test report.

5.3.3 eMRTD reception

5.3.3.1 Purpose

See ISO/IEC 10373-6:2016, 7.2.3.1.

5.3.3.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.2.3 on 3 separate samples under the following conditions:

— every supported PCD to PICC bitrate;

— at room temperature.

Any PICC to PCD bit rate may be used. The three tests conditions defined in ISO/IEC 10373-6:2016, 7.2.3 shall be executed at least five times for each combination of field.

For each PCD to PICC bit rate supported by the eMRTD, the eMRTD shall respond correctly to an I-block containing the TEST_COMMAND1 as defined in 5.5 after selection of that bit rate.

5.3.3.3 Test report

The test report shall confirm the intended operation at the supported PCD to PICC bit rates. Used test conditions shall be mentioned in the test report.

5.3.4 eMRTD maximum loading effect

5.3.4.1 Purpose

See ISO/IEC 10373-6:2016, 7.2.5.1 amended by ISO/IEC 10373-6:2016/Amd.3:2018.

5.3.4.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.2.5 amended by ISO/IEC 10373-6:2016/Amd.3:2018 on 3 separate samples at room temperature.

5.3.4.3 Test report

The test report shall give the values of the measured field strength.

5.3.5 eMRTD resonance frequency (optional)

5.3.5.1 Purpose

See ISO/IEC 10373-6:2016, 7.2.4.1.

This test is optional and shall be applied only if the applicant provides a resonance frequency range in Table 3.

5.3.5.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.2.4 on 3 separate samples at room temperature.

5.3.5.3 Test report

The test report shall state whether the measured resonance frequency is within the range of resonance frequency declared by the applicant in Table 3.

In addition, the test report shall describe the applied test setup and conditions.

5.3.6 eMRTD EMD level and low EMD time test (optional)

5.3.6.1 Purpose

See ISO/IEC 10373-6:2016, 7.2.2.1.

This test is optional.

5.3.6.2 Test procedure

Modify the procedure ISO/IEC 10373-6:2016, 7.2.2 by computing the maximum signal out of the two results obtained in step g) and by applying following step h) on the computed signal.

Apply the modified procedure on 3 separate samples under following conditions:

— at 1,5 A/m and 7,5 A/m;

— PICC to PCD $f_c/128$ and $f_c/32$ bitrate;

— at room temperature.

Any PCD to PICC bit rate may be used. The test procedure shall be executed on all ISO/IEC 14443-3 commands and at least, on the first occurrence of the command listed in each steps of TEST_COMMAND_SEQUENCE1 defined in 5.5 after appropriate PICC to PCD bit rate selection.

5.3.6.3 Test report

The test report shall state whether the eMRTDs EMD level during $t_{E,PCD}$ complies with the requirements defined in ISO/IEC 14443-2.

Furthermore, the test report shall give the measured maximum electromagnetic disturbance levels of the upper and lower sidebands at $f_c + f_s$ and $f_c - f_s$ during $t_{E,PCD}$.

5.4 Test of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters

Perform the tests defined in ISO/IEC 10373-6:2016, Annex G and Annex L at room temperature and 1,5 A/m(rms) according to the information provided in Table 3. The test command sequences to apply are defined in 5.5. The appropriate block number in each test scenario needs to be respected.

S(PARAMETERS) empty block information tag 'A0 00' CRC shall be used in scenarios G.66 to G.70.

Tests ISO/IEC 10373-6:2016, G.3.2 polling and ISO/IEC 10373-6:2016, G.4.2 polling shall be executed with the minimum delay between each Type as defined in Doc 9303-10, B.2.

NOTE The operating field condition chosen to perform these tests [1,5 A/m (rms)] represents the worst case.

5.5 List of the test command sequences

5.5.1 General

This subclause provides the list of test command sequences depending on the access control mechanism declared in Table 3. The laboratory may increase the test coverage by using additional commands.

5.5.2 Test commands for eMRTD supporting only BAC

5.5.2.1 TEST_COMMAND_SEQUENCE1

TEST_COMMAND_SEQUENCE1 as defined in Table 4 is the sequence of commands, used for operating field strength test.

TEST_COMMAND_SEQUENCE1 shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 4 — TEST_COMMAND_SEQUENCE1, UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	'00 A4 04 0C 07 A0 00 00 02 47 10 01'
2	GET CHALLENGE	'00 84 00 00 08'
3	MUTUAL AUTHENTICATE	'00 82 00 00 28 <authentication token> 28'
4	INTERNAL AUTHENTICATE[a]	According to AA key length, select following command: '0C 88 00 00 20 87 11 01 <encrypted challenge> 97 01 00 8E 08 <mac> 00 'or '0C 88 00 00 00 00 21 87 11 01 <encrypted challenge> 97 02 00 00 8E 08 <mac> 00 00'
5	READ BINARY	'0C B0 82 00 0D 97 01 80 8E 08 <mac> 00'

[a] INTERNAL AUTHENTICATE command is sent only if AA is supported by eMRTD.

5.5.2.2 TEST_COMMAND1

5.5.2.2.1 TEST_COMMAND1(1)

TEST_COMMAND1(1) as defined in Table 5 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) consisting of one unchained I-block.

TEST_COMMAND1 shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 5 — TEST_COMMAND1(1), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	'00 A4 04 0C 07 A0 00 00 02 47 10 01'

5.5.2.2.2 TEST_COMMAND1(2)

TEST_COMMAND1(2) as defined in Table 6 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) consisting of two chained I-blocks (eMRTD reader chaining).

TEST_COMMAND1(2) shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 6 — TEST_COMMAND1(2), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	First I-block: '00 A4 04 0C 07' Second I-block: 'A0 00 00 02 47 10 01'

5.5.2.2.3 TEST_COMMAND1(3)

TEST_COMMAND1(3) as defined in Table 7 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) consisting of three chained I-blocks (eMRTD reader chaining).

TEST_COMMAND1(3) shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 7 — TEST_COMMAND1(3), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	First I-block: '00 A4 04 0C 0C' Second I-block: 'A0 00 00 02' Third I-block: '47 10 01'

5.5.2.3 TEST_COMMAND2

5.5.2.3.1 TEST_COMMAND2(2)

TEST_COMMAND2(2) as defined in Table 8 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) which expects a response consisting of two chained I-blocks.

TEST_COMMAND2(2) shall come after:

— eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed;

— LDS application 'A0 00 00 02 47 10 01' is successfully selected;

— basic access is granted.

Table 8 — TEST_COMMAND2(2), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	READ BINARY	If extended length is not supported: '0C B0 82 00 0D 97 01 80 8E 08 <mac> 00' [a] If extended length is supported: '0C B0 82 00 00 00 0E 97 02 01 00 8E 08 <mac> 00 00' [b]

[a] The recommended maximum frame size is 128 bytes (FSD = 128/FSDI = 7). In this case, maximum frame size test with FSD = 256 is not applicable.

[b] The recommended maximum frame size is 256 bytes (FSD=256/FSDI=8).

TEST_COMMAND2(2) may be adapted to increase the coverage of FSD test by modifying Le value.

5.5.2.3.2 TEST_COMMAND2(3)

TEST_COMMAND2(2) as defined in Table 9 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) which expects a response consisting of two chained I-blocks.

TEST_COMMAND2(3) shall come after:

— eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed;

— LDS application 'A0 00 00 02 47 10 01' is successfully selected;

— basic access is granted.

Table 9 — TEST_COMMAND2(3), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	READ BINARY	If extended length is not supported: '0C B0 82 00 0D 97 01 80 8E 08 <mac> 00'[a] If extended length is supported: '0C B0 82 00 00 00 0E 97 02 02 00 8E 08 <mac> 00 00'[b]
[a] The recommended maximum frame size is 64 bytes (FSD = 64/FSDI = 5).		
[b] The recommended maximum frame size is 256 bytes (FSD=256/FSDI=8).		

5.5.2.4 TEST_COMMAND3

TEST_COMMAND3 is the default test command consisting of one I-block which needs more than FWT time for execution. This command is defined by the applicant or by the laboratory. If the eMRTD does not support any command needing more than FWT time for execution, the scenarios using TEST_COMMAND3 are not applicable.

5.5.3 Test commands for eMRTD supporting PACE

5.5.3.1 General

These test commands shall be used for eMRTD with PACE. It shall be also used for eMRTD supporting BAC in addition to PACE.

5.5.3.2 TEST_COMMAND_SEQUENCE1

TEST_COMMAND_SEQUENCE1 as defined in Table 10 is the sequence of commands, used for operating field strength test.

TEST_COMMAND_SEQUENCE1 shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 10 — TEST_COMMAND_SEQUENCE1, UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	READ BINARY for EF.CardAccess	'00 B0 9C 00 06' '00 B0 00 06 E0' ...
2	MSE: Set AT	'00 22 C1 A4 <L_c> 80 <L_{80}> <PACE OID> 83 01 01 84 <L_{84}> <private key reference>'
3	GENERAL AUTHENTICATE for encrypted nonce	'10 86 00 00 <L_c> 7C 00 00'
4	GENERAL AUTHENTICATE to map the nonce	'10 86 00 00 <L_c> 7C <L_{7C}> 81 <L_{81}> <Mapping Data> 00'
5	GENERAL AUTHENTICATE to perform Key agreement	'10 86 00 00 <L_c> 7C <L_{7C}> 83 <L_{83}> <Ephemeral Public Key> 00'
6	GENERAL AUTHENTICATE to perform Mutual Authenticate	'00 86 00 00 <L_c> 7C <L_{7C}> 85 <L_{85}> <Authentication Token> 00'
[a] INTERNAL AUTHENTICATE command is sent only if AA is supported by eMRTD.		

Table 10 *(continued)*

Step	Command	COMMAND UT_APDU
7	SELECT	'0C A4 04 0C <L_c> 87 <L_{87}> 01 <Cryptogram> 8E 08 <Checksum> 00'
8	INTERNAL AUTHENTICATE[a]	According to AA key length, select following command: '0C 88 00 00 20 87 11 01 <encrypted challenge> 97 01 00 8E 08 <mac> 00' or '0C 88 00 00 00 00 21 87 11 01 <encrypted challenge> 97 02 00 00 8E 08 <mac> 00 00'
9	READ BINARY for EF.DG2	'0C B0 82 00 0D 97 01 06 8E 08 <mac> 00'
[a] INTERNAL AUTHENTICATE command is sent only if AA is supported by eMRTD.		

NOTE The EF.CardAccess can be read implicitly or explicitly (SELECT EF.CardAccess command sent before READ BINARY).

5.5.3.3 TEST_COMMAND1

5.5.3.3.1 TEST_COMMAND1(1)

TEST_COMMAND1(1) as defined in Table 11 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) consisting of one unchained I-block.

TEST_COMMAND1 shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 11 — TEST_COMMAND1(1), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	'00 A4 04 0C 07 A0 00 00 02 47 10 01'

5.5.3.3.2 TEST_COMMAND1(2)

TEST_COMMAND1(2) as defined in Table 12 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) consisting of two chained I-blocks (eMRTD reader chaining).

TEST_COMMAND1(2) shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 12 — TEST_COMMAND1(2), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	First I-block: '00 A4 04 0C 07' Second I-block: 'A0 00 00 02 47 10 01'

5.5.3.3.3 TEST_COMMAND1(3)

TEST_COMMAND1(3) as defined in Table 13 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) consisting of three chained I-blocks (eMRTD reader chaining).

TEST_COMMAND1(3) shall come after eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

Table 13 — TEST_COMMAND1(3), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	SELECT	First I-block: '00 A4 04 0C 0C' Second I-block: 'A0 00 00 02' Third I-block: '47 10 01'

5.5.3.4 TEST_COMMAND2

5.5.3.4.1 TEST_COMMAND2(2)

TEST_COMMAND2(2) as defined in Table 14 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) which expects a response consisting of two chained I-blocks.

TEST_COMMAND2(2) shall come after:

— eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed.

— PACE is granted.

— LDS application 'A0 00 00 02 47 10 01' is successfully selected.

Table 14 — TEST_COMMAND2(2), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	READ BINARY	If extended length is not supported: '0C B0 82 00 0D 97 01 80 8E 08 <mac> 00' [a] If extended length is supported: '0C B0 82 00 00 00 0E 97 02 01 00 8E 08 <mac> 00 00'[b]

[a] The recommended maximum frame size is 128 bytes (FSD = 128/FSDI = 7). In this case, maximum frame size test with FSD=256 is not applicable.

[b] The recommended maximum frame size is 256 bytes (FSD=256/FSDI=8).

TEST_COMMAND2(2) may be adapted to increase the coverage of FSD test by modifying Le value.

5.5.3.4.2 TEST_COMMAND2(3)

TEST_COMMAND2(2) as defined in Table 15 is the default test command used for tests of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters (5.4) which expects a response consisting of two chained I-blocks.

TEST_COMMAND2(3) shall come after:

— eMRTD activation process described in ISO/IEC 10373-6:2016, G.5.1.1 shall be performed;

— PACE is granted;

— LDS application 'A0 00 00 02 47 10 01' is successfully selected.

Table 15 — TEST_COMMAND2(3), UT_APDU command definition

Step	Command	COMMAND UT_APDU
1	READ BINARY	If extended length is not supported: '0C B0 82 00 0D 97 01 80 8E 08 <mac> 00'[a] If extended length is supported: '0C B0 82 00 00 00 0E 97 02 02 00 8E 08 <mac> 00 00'[b]
[a] The recommended maximum frame size is 64 bytes (FSD = 64/FSDI = 5).		
[b] The recommended maximum frame size is 256 bytes (FSD=256/FSDI=8).		

5.5.3.5 TEST_COMMAND3

TEST_COMMAND3 is the default test command consisting of one I-block which needs more than FWT time for execution. This command is defined by the applicant or by the laboratory. If the eMRTD does not support any command needing more than FWT time for execution, the scenarios using TEST_COMMAND3 are not applicable.

5.6 Functionality check test

5.6.1 General

For potentially destructive tests such as mechanical and electrical (ISO/IEC 14443-1 parameters) stress tests, it is often required to check if the eMRTD "operates as intended". These tests are not defined further by the ISO/IEC standards, and thus they are left to the responsibility of the test laboratories.

Since there can be different requirements for performing functionality check tests, this subclause specifies two optional tests to verify the eMRTD's functionality on the electrical and on the application level without performing all these, sometimes time-consuming tests specified in this document.

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.

5.6.2 Optional procedure 1: Application functionality check test

5.6.2.1 Purpose

This test is a basic functionality check test.

The purpose of this test is to check if the eMRTD's mandatory LDS application data as specified in ICAO Doc 9303-10 can be retrieved from the eMRTD. It shall be verified that this information has not been altered by the destructive tests.

5.6.2.2 Test setup

The test may be performed with standard PC/SC readers and any software that is able to send commands to the eMRTD and that can verify the integrity of the data retrieved.

5.6.2.3 Test procedure

The test procedure shall be performed as follows:

a) put the eMRTD on the contactless reader of the test setup;

b) activate the eMRTD as described in ISO/IEC 10373-6:2016, G.5.1.1;

c) select the LDS application;

d) perform access control if indicated in the implementation conformance statement;

e) read data of file EF.COM;

f) read data of file EF.DG1;

g) read data of file EF.DG2;

h) read the document security object of file EF.SOD.

5.6.2.4 Test report

The test report shall state whether the defined LDS application data can be retrieved and whether the data has been altered.

5.6.3 Optional procedure 2: Electrical functionality check test

5.6.3.1 Purpose

The purpose of this test is to check the electrical functionality of the eMRTD and may be used in addition to the process specified in ISO/IEC 10373-6:2016, G.5.1.1.

5.6.3.2 Test setup

For this test, the test setup defined in the corresponding tests shall be used.

5.6.3.3 Test procedure

The test procedure shall be performed using at least one of the following methods:

— apply resonance frequency test as specified in 5.3.5;

— apply operating field strength test as specified in 5.3.2.

5.6.3.4 Test report

The test report shall state whether the resonance frequency is in the range specified in the implementation conformance statement or whether the eMRTD operates as intended for all combinations of temperatures and field strengths.

6 Test methods for eMRTD reader

6.1 General test conditions

6.1.1 General

Test conditions and procedures in this clause are based on ISO/IEC 10373-6 taking into account specific needs of eMRTD application.

This clause addresses the test of the mandatory and optional features of eMRTD reader contactless interface. The minimum number of samples provided for testing is one.

6.1.2 to 6.1.6 specify the different test setups, the values used for the tests and a recommendation of the report.

Errors shall be handled in the eMRTD reader and not in the upper tester or host. If possible, the final operating system shall be tested.

6.1.2 Test environment

Unless otherwise specified, testing shall take place in an environment of temperature 23 °C ± 3 °C (73 °F ± 5 °F) and of relative humidity 25 % to 75 %.

6.1.3 Test conditions for PCD

Unless otherwise specified, the test conditions defined in Table 16 shall be applied:

Table 16 — Test conditions for PCD

Conditions	Values
Type	Type A and Type B
Test positions	Appropriate test positions defined in Table 7 according to the reader type.
Reference PICC	Reference PICC 1 In accordance with the support of optional PICC classes as declared by the PCD manufacturer in Table 6: — Reference PICC 2 if PICC Class 2 is supported; — Reference PICC 3 if PICC Class 3 is supported.

Unless otherwise specified, the values defined in Table 17 shall be used to adjust parameters of PCD-test-apparatus:

Table 17 — Values of the PCD-test-apparatus unless otherwise specified

Parameter	Value	Applies to
PCD to PICC and PICC to PCD Bit rates	$f_c/128$	Type A and Type B
Load modulation amplitude	More than 20 mV at H_{min}	Type A and Type B
Reference PICC Resonance frequency	16,5 MHz	Type A and Type B
J1 setting	position “a”	Type A and Type B
J2 setting	position “a”	Type A and Type B
Reference PICC position	X = 0, Y = 0, Z = 7,5 mm	Type A and Type B
Start of frame timing (SOF)	10 etu “0” followed by 2 etu “1”	Type B
End of frame timing (EOF)	10 etu “0”	Type B
Extra guard time (EGT)	0 etu	Type B
TR0 for ATQB and DESELECT	$200/f_s$	Type B
Frame waiting time	Any value as specified in ISO/IEC 14443-4:2018, 7.2	Type A and Type B
TR1	$140/f_s$	Type B
FSCI	8	Type A
Maximum frame size code in ATQB	8	Type B

6.1.4 Applicant information

In order to set up the tests properly, the information specified in Table 18 shall be known by the laboratory. The information not accessible to the laboratory from the sample itself shall be provided by the applicant.

Table 18 — Applicant Information on eMRTD reader Product

Product characteristic	Standard reference	Applicant declaration
Reader design type	6.6	Type:
(Optional) PCD to PICC supported bit rates	ICAO Doc 9303-10, C.4	List of supported optional PCD to PICC bit rates
(Optional) PICC to PCD supported bit rates	ICAO Doc 9303-10, C.4	List of supported optional PICC to PCD bit rates
Operating temperature range	ICAO Doc 9303-10, C.8	Declare the minimum and maximum temperature values
Maximum frame size supported	ICAO Doc 9303-10, C.7	Declare the maximum frame size in reception
PCD internal output buffer size	ICAO Doc 9303-10, C.7	Declare the maximum size of an APDU sent by the PCD
(Optional) Frames with error corrections supported	ICAO Doc 9303-10, C.7	YES/NO
(Optional) Support of additional PICC classes	ICAO Doc 9303-10, C.6	List of supported optional PICC classes (2 and/or 3).
(Optional) Support of CID	ICAO Doc 9303-10, C.9	YES/NO
(Optional) Support of EMD	ICAO Doc 9303-10, C.5	YES/NO
Support of Anticollision	ICAO Doc 9303-10, C.10	YES/NO

Laboratory may ask if PC/SC is supported or not with available interface.

6.1.5 Test 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 shall be included.

6.1.6 Definition of test positions

6.1.6.1 General

ISO/IEC 14443-1 and ISO/IEC 14443-2 parameters tests shall be performed over a certain set of points within the defined volume.

6.1.6.2 Volume definition

Volume dimensions are defined in 6.6, depending on “eMRTD reader design types”. If due to the construction and/or normal use of the eMRTD reader other dimension sizes are recommended by the manufacturer of the eMRTD reader, the test laboratory shall check if these dimension sizes are appropriate and define the dimensions of the volume accordingly.

6.1.6.3 Volume location

The eMRTD reader manufacturer shall define the position of the volume in the technical documentation of the eMRTD reader. The volume shall be located with one surface exactly on the surface of the eMRTD reader.

eMRTD reader shall be tested inside of their housing, exactly as they are used in border control applications.

Applying the eMRTD reader type concept, it is required to consider mechanical and optical constraints specific to an eMRTD reader. The test may be adapted to match these constraints. The report shall state the specific operating conditions during a particular test.

6.1.6.4 Test positions

Test positions are defined in 6.6.

Height Z = 0 mm: The Reference PICC shall be placed exactly at the bottom of the volume (at the surface of the scanner plate, if appropriate).

Height Z = x mm: The top surface of the Reference PICC shall be located in a distance of x mm of the bottom of the volume (in a distance of x mm from the surface of the scanner plate, if appropriate).

6.2 Test of ISO/IEC 14443-1 parameters

6.2.1 Alternating magnetic field

6.2.1.1 Purpose

See ISO/IEC 10373-6:2016, 6.1.1.1.

6.2.1.2 Test procedure

Apply ISO/IEC 10373-6:2016, 6.1.1 in any possible PICC position using Reference PICC 1 at room temperature. Test is performed after step INITIALIZE_PCD_TEST_MODE.

6.2.1.3 Test report

The test report shall give the DC voltage measured at CON3.

6.3 Test of ISO/IEC 14443-2 parameters

6.3.1 Carrier frequency

6.3.1.1 Purpose

The purpose of this test is to check if the eMRTD reader generates a carrier frequency in the range defined in ISO/IEC 14443-2.

6.3.1.2 Test procedure

Use appropriate frequency meter at room temperature to measure the frequency when the operating field is present.

6.3.1.3 Test report

The test report shall give the measured frequency and shall state or not whether the frequency is in accordance with ISO/IEC 14443-2.

6.3.2 eMRTD reader field strength

6.3.2.1 Purpose

See ISO/IEC 10373-6:2016, 7.1.1.1.

6.3.2.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.1.1 under the following conditions:

— at room temperature;

— set H_{min} to 1,5 A/m (rms) only for eMRTD type M reader and set H_{min} to 2 A/m (rms) for other reader type.

Test is performed after step INITIALIZE_PCD_TEST_MODE.

6.3.2.3 Test report

The test report shall give the DC voltage measured at CON3 for R2 or variable load resistor adjusted to H_{min} and H_{max} under the conditions applied.

6.3.3 Modulation index and waveform

6.3.3.1 Purpose

See ISO/IEC 10373-6:2016, 7.1.4.1.

6.3.3.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.1.4 at room temperature under the following conditions for all declared bit rates in Table 6.

For a PCD to PICC bit rate of $f_c/128$, any activation command may be used. For PCD to PICC bit rates higher than $f_c/128$, any ISO/IEC 14443-4 frame from default test command sequence (see 6.5), after appropriate PCD to PICC bit rate selection may be used.

Testing with other Reference PICCs resonance frequencies than 16,5 MHz is optional.

NOTE 1 Testing with resonance frequencies 13,56 MHz, 15 MHz and 19 MHz increases interoperability.

NOTE 2 For bit rates higher than $f_c/128$, the PCD-test-apparatus defined in ISO/IEC 10373-6:2016, H.1 is also used to send a test command.

6.3.3.3 Test report

The test report shall give the measured modulation index of the eMRTD reader field, the rise and fall times and overshoot values, within the defined operating volume.

6.3.4 Load modulation reception

6.3.4.1 Purpose

See ISO/IEC 10373-6:2016, 7.1.5.1.

6.3.4.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.1.5 under the following conditions:

— at room temperature, at the appropriate test positions defined in Table 14 according to the reader type;

— at minimum and maximum temperatures, at nominal position as defined in Table 5;

— at all supported PICC to PCD bit rates, except bit rates of $f_c/64$, $f_c/32$ and $f_c/16$.

For a PICC to PCD bit rate of $f_c/128$, any activation command may be used. For PICC to PCD bit rates higher than $f_c/128$, any ISO/IEC 14443-4 frame from default test command sequence (see 6.5), after appropriate PCD to PICC bit rate selection may be used.

Testing with other Reference PICCs resonance frequencies than 13,56 MHz and 15 MHz is optional.

NOTE 1 Testing with resonance frequencies 12 MHz and 16,5 MHz increases interoperability.

NOTE 2 For bit rates higher than $f_c/128$, the PCD-test-apparatus defined in ISO/IEC 10373-6:2016, H.1 is also used to send a test command.

6.3.4.3 Test report

The test report shall give the eMRTD reader load modulation sensitivity for the tested positions.

6.3.5 eMRTD reader EMD immunity test (optional)

6.3.5.1 Purpose

See to ISO/IEC 10373-6:2016, 7.1.6.1.

This test is optional.

6.3.5.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.1.6 using Reference PICC 1 under the following conditions:

— at room temperature;

— at nominal position as defined in Table 5;

— at PICC to PCD bit rate of $f_c/128$.

The test procedure shall be executed on all commands and responses of protocol activation and UT_TEST_COMMAND1 defined in 6.5.

6.3.5.3 Test report

The test report shall state whether the eMRTD reader was insensitive to any load modulation amplitude below $V_{E,PCD}$.

6.3.6 eMRTD reader EMD recovery test (optional)

6.3.6.1 Purpose

See ISO/IEC 10373-6:2016, 7.1.7.1.

This test is optional.

6.3.6.2 Test procedure

Apply ISO/IEC 10373-6:2016, 7.1.7 using Reference PICC 1 under the following conditions:

— at room temperature;

— at nominal position as defined in Table 5;

— at PICC to PCD bit rate of $f_c/128$.

The test procedure shall be executed on all commands and responses of protocol activation and UT_TEST_COMMAND1 defined in 6.5.

6.3.6.3 Test report

The test report shall report whether the eMRTD reader was not disturbed by the test pattern sent before the eMRTD answer (or was able to recover from the test pattern).

6.4 Test of ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters

Perform the test defined in ISO/IEC 10373-6:2016, Annex H, ISO/IEC 10373-6:2016, Annex I and ISO/IEC 10373-6:2016, Annex L at room temperature and nominal position as defined in 6.1.2 according to the declarations made in Table 6. The test commands to apply are defined in 6.5.

Apply the pass criteria defined in ISO/IEC 10373-6:2016, Table H.13 with the minimum delay between each type as defined in Doc 9303-9, C.3. In addition, verify that at least one polling command for both Type A and Type B occur within the delay defined in ICAO Doc 9303.

In ISO/IEC 10373-6:2016, H.4.3.2.10, the textual procedure defined in steps a) to l) shall be ignored. The correct test to apply shall follow the table for Scenario H.27.

When the support of Anticollision is set to No in Table 18, the following changes apply in ISO/IEC 10373-6:2016:

— H.2.3 Handling of bit collision during ATQA test shall be flagged as No Applicable in the test report;

— H.2.4.2.4 (Procedure 4) in H.2.4 Handling of anticollision loop test shall be flagged as No Applicable in the test report;

— all procedures having only steps referring to S(DESELECT) shall be deleted;

— all optional steps referring to S(DESELECT) shall be deleted.

The deletion of procedures and steps referring to S(DESELECT) implies at least the following changes:

— The following ISO/IEC 10373-6:2016 tests shall be flagged as No Applicable in the test report:

  — H.4.3.2.4 (Procedure 4) in H.4.3 Error detection and recovery test;

  — H.4.3.2.12 (Procedure 12) in H.4.3 Error detection and recovery test.

— In ISO/IEC 10373-6:2016, the following changes shall be made and the updated scenarios shall be performed successfully:

  — in H.4.3.2.2, delete steps e) and f) and update Scenario H.19 accordingly;

  — in H.4.3.2.3, delete the last two lines of Scenario H.20;

  — in H.4.3.2.6, delete steps e) and f) and update Scenario H.23 accordingly;

  — in I.2.1, update steps h) and i) to allow a field reset instead of an S(DESELECT) and update Scenario I.1 accordingly;

  — in I.2.2, update steps g) and h) to allow a field reset instead of an S(DESELECT) and update Scenario I.2 accordingly;

  — in I.2.3, update steps h) and i) to allow a field reset instead of an S(DESELECT) and update Scenario I.3 accordingly;

  — in L.1.1.3, update steps h) and i) to allow a field reset instead of an S(DESELECT) and update Scenario L.1 accordingly.

6.5 List of test command sequences

6.5.1 General

This subclause defines the test command sequences used for tests of ISO/IEC 14443-1, ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters, as correspondingly indicated in the test procedures of 6.2, 6.3 and 6.4.

6.5.2 Test commands

6.5.2.1 UT_TEST_COMMAND1

UT_TEST_COMMAND1 as defined in Table 19 and Table 20 defines the instruction coding used as the default instruction for scenarios not needing PCD chaining.

Table 19 — UT_TEST_COMMAND1, command UT_APDU definition

Command	COMMAND UT_APDU
UT_TEST_COMMAND1	' 00 DA 00 00 0E AA AA F0 FF 04 05 06 07 08 09 0A 0B 0C 0D'[a]

Table 20 — UT_TEST_COMMAND1, response UT_APDU definition

Answer	RESPONSE UT_APDU
Answer to UT_TEST_COMMAND1	' 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 90 00'

6.5.2.2 UT_TEST_COMMAND2

UT_TEST_COMMAND2 as defined in Table 21 and Table 22 defines the instruction coding used as the default instruction for scenarios dealing with PCD chaining.

Table 21 — UT_TEST_COMMAND2, command UT_APDU definition

Command	COMMAND UT_APDU
UT_TEST_COMMAND2	For FSCI ≤ 8: '00 DA 00 00 FF 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11...FE FF' For FSCI > 8: '00 DA 00 00 00 10 00 00 01 00 02 00 03 00 04 00 05 ...0F FF 10 00'

Table 22 — UT_TEST_COMMAND2, response UT_APDU definition

Answer	RESPONSE to UT_APDU
Answer to UT_TEST_COMMAND2	First I-block: '01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F' Second I-block: '11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F' Third I-block: '90 00'

6.5.3 Default test command sequence

The test command sequence as defined in Table 23 shall be applied as default test command sequence for procedures or scenarios dealing with at least one I-block.