ecma INTERNATIONAL

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NFCIP-2 test methods

Standard

Rue du Rhône 114 CH-1204 Geneva T: +41 22 849 6000 F: +41 22 849 6001

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Introduction

This Standard specifies test methods for ECMA-352 in addition to those specified in the referenced standards.

This 2nd edition is fully aligned with the 2nd edition of ISO/IEC 19369:2024. The main changes include a new Clause 3, an adaptation of the test methods to align with ISO/IEC 21481 and a new Annex A.

This Ecma Standard was developed by Technical Committee 51 and was adopted by the General Assembly of June 2025.

NFCIP-2 test methods

1 Scope

This Standard specifies requirements to verify NFCIP-2 mode selection and initial communication in the selected modes. The Test Management Service Data Units and the interface over which they are exchanged are out of scope.

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.

ECMA-340 *NFCIP-1 – Near Field Communication Interface and Protocol 1 (*ISO/IEC *18092)*

ECMA-352 *NFCIP-2 – Near Field Communication Interface and Protocol 2 (ISO/IEC 21481)*

ECMA-362 *NFCIP-1 - Protocol Test Methods (ISO/IEC 23917)*

ISO/IEC 9646 (all parts), *Information technology — Open Systems Interconnection — Conformance testing methodology and framework*

ISO/IEC 10373-6, *Cards and security devices for personal identification — Test methods — Part 6: Contactless proximity objects*

ISO/IEC 10373-7, *Cards and security devices for personal identification — Test methods — Part 7: Contactless vicinity objects*

ISO/IEC 14443-3, *Cards and security devices for personal identification — Contactless proximity objects — Part 3: Initialization and anticollision*

ISO/IEC 15693-2, *Cards and security devices for personal identification — Contactless vicinity objects — Part 2: Air interface and initialization*

ISO/IEC 15693-3, *Cards and security devices for personal identification — Contactless vicinity objects — Part 3: Anticollision and transmission protocol*

3 Terms and definitions

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

ISO and IEC maintain terminology 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
PICC mode emulator
functionality to behave as proximity card or object (PICC) mode

Note 1 to entry: PICC mode is specified in ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4.

3.2
VICC mode emulator
functionality to behave as vicinity card or object (VICC) mode

Note 1 to entry: VICC mode shall be compliant with the mandatory VICC requirements of ISO/IEC 15693-2 and ISO/IEC 15693-3.

4 Symbols and abbreviated terms

ATQA	Answer To reQuest, type A
ATQB	Answer To ReQuest, type B
IUT	implementation under test
PCD	proximity coupling device
PICC	proximity card or object
REQA	REQest command, type A
REQB	REQest command, type B
RF	radio frequency
TB-PDU	transmission block – protocol data unit
TM-SDU	test management – service data unit
UT	upper tester
LT	lower tester
VCD	vicinity coupling device
VICC	vicinity card or object

5 Test environment and apparatus

The concepts and abstract model of the ISO/IEC 9646 series shall be used to verify the operation of an IUT in accordance with ECMA-352.

The NFCIP-2 test apparatus consists of a UT and an LT as illustrated in Figure 1.

To communicate with the IUT, e.g. to select modes on the IUT, the UT and IUT exchange TM-SDUs. The SDU definition and the interface between UT and IUT are out of scope of this document.

The NFCIP-2 test apparatus shall implement the specified modes at its LT interface in accordance with the requirements of the test scenarios specified in Clause 6.

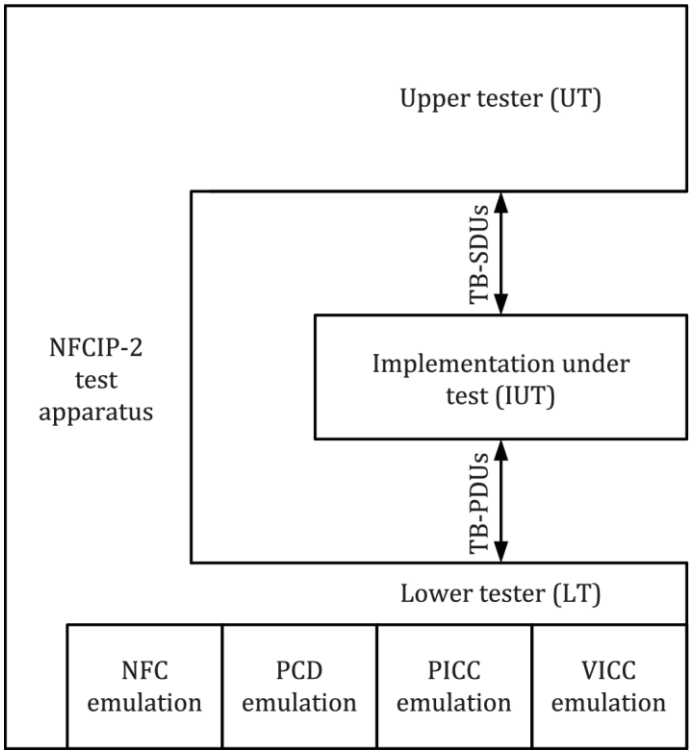

Figure 1 — Test configuration

6 Tests

6.1 Testing of external RF field detection and RF field generation

This test is to verify that the IUT, on which PCD mode or VCD or NFC initiator for passive communication mode is selected:

— does not switch on its RF field while detecting an external field;

— switches on its RF field when detecting no external field.

To carry this out, configure the LT as a test circuit and perform the following tests:

a) place IUT in the operating volume of the LT;

b) let the LT switch on its field;

c) select VCD mode on IUT and verify that the IUT does not generate a field;

d) select PCD mode on IUT and verify that the IUT does not generate a field;

e) select NFC mode (initiator for passive communication mode) on IUT and verify that the IUT does not generate a field.

6.2 Testing of mode selection and switching

6.2.1 General

The purpose of the test methods in this subclause is to verify that the behaviour of the IUT in conformity with the requirements for each mode when selecting a mode, i.e. PICC mode, PCD mode, VCD mode and NFC mode.

6.2.2 Test PICC mode

a) Select PICC mode on the IUT and place it into the operating volume of the LT;

b) Select PCD mode on the LT, and let the LT send REQA of ISO/IEC 14443-3:

   1) If the IUT answers with ATQA of ISO/IEC 14443-3 within 1 ms and passes the PICC tests specified in ISO/IEC 10373-6, it passes the test; otherwise

   2) Let the LT send REQB of ISO/IEC 14443-3: if the IUT answers with ATQB of ISO/IEC 14443-3 within 1 ms and passes the PICC tests specified in ISO/IEC 10373-6, it passes the test, otherwise it fails the test.

NOTE The 1 ms limit accommodates NFCIP-2 implementations to answer with ATQA or ATQB of ISO/IEC 14443-3.

6.2.3 Test PCD mode

a) Place LT in the operating volume of the IUT;

b) Select PCD mode on the IUT;

c) Select PICC mode on the LT and use ISO/IEC 10373-6 to verify that the IUT passes all test cases specified for PCD with the LT as PICC mode emulator.

6.2.4 Test VCD mode

a) Place LT in the operating volume of the IUT;

b) Select VCD mode on the IUT;

c) Select VICC mode on the LT and use ISO/IEC 10373-7 to verify that the IUT passes all test cases specified for VCD with the LT as VICC mode emulator.

6.2.5 Test NFC mode — Target and initiator

a) Place IUT in the operating volume of the LT;

b) Select NFC mode on the IUT;

c) Use ECMA-362 to verify that the IUT passes all test cases.

   Test report and testing requirements shall be in accordance with ECMA-352.

6.3 Capturing of test results

The test results shall be captured in the test report template as specified in Annex A.

Annex A
(normative)

Test report template

Test report and testing requirements shall be in accordance with ECMA-352.Supplier:

Product and sample information:

Number of passed tests versus the total number of tests:

Number of different samples:

Date of the tests:

No	Test name and reference	Expected result according to ECMA-352	Clause in ECMA-352	Condition	Test results PASS/FAIL
1	6.1 Testing of External RF Field detection and RF field generation	The test passes if the IUT does not switch on its field.	7, 8	VCD mode selected on IUT	
				PCD mode selected on IUT	
				NFC mode (initiator for passive communication mode) selected on IUT	
2	6.2.2 Test PICC mode	The test passes if the IUT responds with ATQA/ATQB within 1 ms and passes the PICC tests specified in ISO/IEC 10373-6.	9	Type A	
				Type B	
3	6.2.3 Test PCD mode	The test passes if the IUT passes all test cases in ISO/IEC 10373-6 specified for PCD with the LT as PICC mode emulator	9		
4	6.2.4 Test VCD mode	The test passes if the IUT passes all test cases in ISO/IEC 10373-7 specified for VCD with the LT as VICC mode emulator	9		
5	6.2.5 Test NFC mode — Target and initiator	The test passes if the IUT passes all test cases in ECMA-362	9	Initiator selected on IUT	
				Target selected on IUT	

Bibliography

[1] ISO/IEC 14443-2, *Cards and security devices for personal identification — Contactless proximity objects — Part 2: Radio frequency power and signal interface*

[2] ISO/IEC 14443-4, *Cards and security devices for personal identification — Contactless proximity objects — Part 4: Transmission protocol*