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Identification cards — Test methods — Part 6: Proximity cards

AMENDMENT 2
Improved RF test methods

Cartes d'identification — Méthodes d'essai — Partie 6: Cartes de proximité

AMENDEMENT 2
Méthodes de test RF améliorées

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Foreword

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Amendment 2 to ISO/IEC 10373-6:2001 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*, Subcommittee SC 17, *Identification cards and related devices*.

Identification cards — Test methods — Part 6: Proximity cards

AMENDMENT 2
Improved RF test methods

Page 2, subclause 3.2

Add the following abbreviations and symbols:

fcm	Frequency of the operating field during the PICC load modulation test
H	Field strength of the PCD antenna field
m	Modulation index as defined in clause 3.3 of ISO/IEC 14443-2
t1, t2	Pulse segments as defined in figure 2 of ISO/IEC 14443-2
tr, tf	Rise and fall times as defined in figure 4 of ISO/IEC 14443-2

Page 6, subclause 6.1.3

Add a note after the last note:

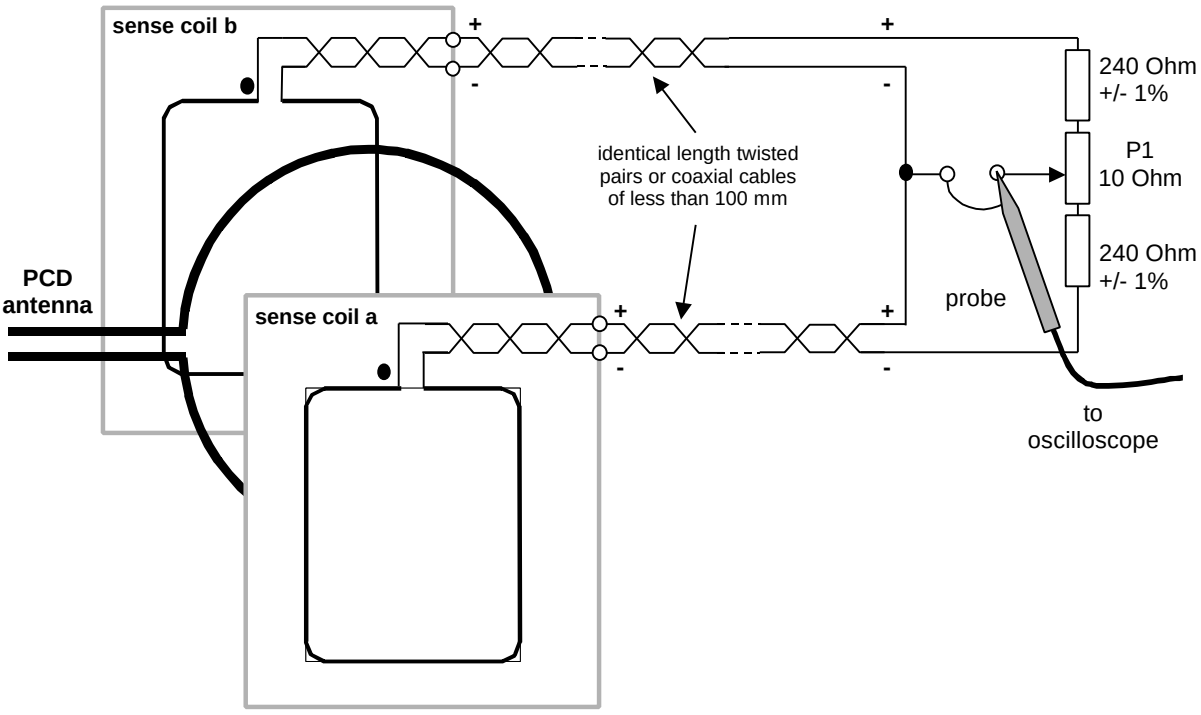
"NOTE The oscilloscope ground connection should be as short as possible"

Page 6, subclause 6.2

In the 4th sentence, replace the value "50 Ohm" for P1 with the value "10 Ohm".

Page 6, figure 4

Replace the figure with the following:



NOTE 1 In order to avoid any unintended misalignment in case of an unsymmetrical set-up the tuning range of the potentiometer P1 is only 10 Ohms. If the set-up cannot be compensated by the 10 Ohm potentiometer P1 the overall symmetry of the set-up should be checked.

NOTE 2 The oscilloscope ground connection should be as short as possible

Figure 4 — Test set-up (principle)

Page 8, subclause 7.2

Add the following paragraphs and notes at the end of the clause:

"The frequency *fcm* of the carrier delivered by the signal generator to the test PCD antenna shall be such that two subcarrier cycles correspond exactly to an integer number of samples. The frequency which fulfils this requirement (with common oscilloscope sampling rates) and which is the closest to the nominal carrier frequency defined in ISO/IEC 14443-2 is 13,559322 MHz.

The discrete Fourier transformation shall be done at the exact sidebands frequencies generated by the PICC under test, i.e. *fcm* x 15 / 16 and *fcm* x 17 / 16. If the programme given in informative annex F of ISO/IEC 10373-6 is used it shall be modified to replace 13,56 MHz by the exact value of *fcm* during the test.

NOTE 1 In order to limit to approximately 5% in the worst case the measurement error due to inexact frequencies the following tolerances apply:
- *fcm* = 13,559322 MHz, with a relative tolerance of ± 50 x 10^{-6}
- *fcm* measurement relative error + oscilloscope sampling rate relative error: ± 10 x 10^{-6}
(The oscilloscope sampling rate error may be compensated if the *fcm* measurement is done by the digital sampling oscilloscope. A better than ± 10 x 10^{-6} relative uncertainty may be achieved by sampling more than 500 periods of unmodulated carrier and using interpolation to know precisely the time of the first and of the last rising edge of the carrier.)

NOTE 2 In order to limit the measurement error due to noise (quantification noise, PICC noise…) the following techniques may be used:
- increase of the oscilloscope sampling rate
- increase of the number of subcarrier cycles used in the Fourier transformation

NOTE 3 For type B PICC load modulation test, the oscilloscope FFT option may also be used on a large number of subcarrier cycles with neither transient effect nor phase shift (i.e. on a stable part of synchronization time TR1 as defined in clause 9.2.5 of ISO/IEC 14443-2)."

Page 8 and 9

Add a new subclause 7.1 "PICC load modulation amplitude"

Renumber subclause 7.1 to 7.1.1

Renumber subclause 7.2 to 7.1.2

Replace the last sentence of the 3rd paragraph with the following:

"In order to minimize transient effects, avoid to analyse a subcarrier cycle immediately following a non-modulating period or a phase shift."

Renumber subclause 7.3 to 7.1.3

Add a new subclause 7.2 "PICC reception"

Add a new subclause 7.2.1 "Purpose" with the following paragraph:

"The purpose of this test is to verify the ability of the PICC to receive the PCD message under the specified conditions given in tables 1 and 2."

Add a new subclause 7.2.2 "Conditions for Type A" with the following paragraph and table:

"Table 1 defines the additional test conditions to be applied for type A."

Table 1 — Additional test conditions for type A

Condition	***H*** (A/m)	**t1** (µs)	**t2** (µs)
1	1,5	3	0,5
2	1,5	2	0,7
3	4,5	3	0,5
4	4,5	2	0,7
5	7,5	3	0,5
6	7,5	2	0,7

Add a new subclause 7.2.2.1 "Test procedure" with the following paragraph:

"Under all these conditions the PICC shall answer to a REQA with ATQA."

Add a new subclause 7.2.2.2 "Test report" with the following paragraph:

"The test report shall confirm the intended operation under the conditions defined in table 1."

Add a new subclause 7.2.3 "Conditions for Type B" with the following paragraph and table:

"Table 2 defines the additional test conditions to be applied for type B."

Table 2 — Additional test conditions for type B

Condition	*H* (A/m)	M (%)	tr (µs)	tf (µs)
1	1,5	8	1	1
2	1,5	8	2	2
3	1,5	14	1	1
4	1,5	14	2	2
5	4,5	8	1	1
6	4,5	8	2	2
7	4,5	14	1	1
8	4,5	14	2	2
9	7,5	8	1	1
10	7,5	8	2	2
11	7,5	14	1	1
12	7,5	14	2	2

Add a new subclause 7.2.3.1 "Test procedure" with the following paragraph:

"Under all these conditions the PICC shall answer to a REQB with ATQB."

Add a new subclause 7.2.3.2 "Test report" with the following paragraph:

"The test report shall confirm the intended operation under the conditions defined in table 2."

Add a new subclause 7.3 "PICC resonance frequency (informative)"

Add a new subclause 7.3.1 "Purpose" with the following paragraphs:

"The test may be used to measure the resonance frequency of a PICC.

When two or more PICCs are placed in the same PCD energizing field, the resonance frequency of each PICC changes to decrease.

Care should be taken in designing each PICC resonance frequency."

Add a new subclause 7.3.2 "Procedure" with the following paragraph:

"The resonance frequency of a PICC is measured by using an impedance analyser or a LCR-meter connected to a calibration coil. The coil of the PICC should be placed on the calibration coil as close as possible, with the axes of the two coils being congruent. The resonance frequency is that frequency at which the resistive part of the measured complex impedance is at maximum."

Add a new subclause 7.3.3 "Test report" with the following paragraph:

"The test report shall give the PICC resonance frequency and the measurement conditions."

Page 9, subclause 8.1.2

Replace the step 2 with the following:

"2. Tune the Reference PICC (Annex D) to 19 MHz:

a) Set jumper J1 to position a.

b) Drive the calibration coil directly from a signal generator with the desired frequency setting.

c) Locate the calibration coil and the Reference PICC as close as possible with the axes of the two coils being congruent.

d) Adjust the Reference PICC capacitor C2 to maximum voltage.

e) Assure final reading of about 3 Volts (dc) at R1 of the Reference PICC by adjusting the generator drive level.

f) Re-adjust the Reference PICC capacitor C2 to maximum voltage, if necessary."

Page 11, subclause 8.4.2

Replace the paragraph with the following:

"Annex E describes a Reference PICC and calibration procedure which allows the sensitivity of a PCD to load modulation to be assessed. This Reference PICC does not emulate the shunt action of all types of PICC, therefore it shall be calibrated at a given field strength *H* in the Test PCD assembly. It shall be used in the PCD field at a position where the field has the same value of *H*. The measurement of C3 (dc) voltage shall be exactly the same for both Reference PICC calibration and PCD load modulation test."

Page 12, figure A.1

Add the following note:

”NOTE The layout of the impedance matching network is informative.”

Page 14, subclause A.2

Replace the note 1 with the following:

"The test PCD assembly as defined in clause 6.2 and in this Annex is intended to be used for time limited measurements, to avoid any overheating of the individual components. If the test is run continuously, power dissipation shall be improved. Care shall be taken to keep maximum voltages and maximum power dissipation within the specified limits of the individual components:
- C1, C2, C3 and C4 shall have a voltage rating of at least 200 V;
- Rext shall be able to dissipate approximately 10 Watts at 7,5 A/m;
- Rext shall be able to dissipate approximately 25 Watts at 12 A/m (if the test PCD assembly is used for testing the maximum alternating magnetic field as required in the clause 4.3.5 of ISO/IEC 14443-1).

NOTE 1 If a heat sink is used Rext should be placed on the ground side of the antenna coil."

Page 19, figure D.1

Add the following note:

"NOTE In order to limit the reverse voltage across bridge rectifier at high field when the jumper is removed or if the value of R1 or of R2 is not low enough to load the voltage at C3 sufficiently, a Zener diode (Value 15 Volts) should be added in parallel to C3."

Change R2 tuning range to 0 - 1 kOhm.