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**Cards and security devices for  
personal identification — Test  
methods —**

**Part 6:  
Contactless proximity objects**

**AMENDMENT 1: Dynamic power level  
management**

*Cartes et dispositifs de sécurité pour l'identification personnelle —  
Méthodes d'essai —*

*Partie 6: Objets sans contact de proximité*

*AMENDEMENT 1: Gestion dynamique de niveau de puissance*



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# Cards and security devices for personal identification — Test methods —

## Part 6: Contactless proximity objects

### AMENDMENT 1: Dynamic power level management

Page 3, 3.2

Add the following symbols:

" $H_0$  PCD field strength during power level management test procedures"

Page 7, 4.7, Table 3

Add the following two rows after the row for "Optional PICC classes":

"

| Parameter                       | Description                                                                                          | Unit |
|---------------------------------|------------------------------------------------------------------------------------------------------|------|
| Support of $PLI_{ATQ}$ handling | Ability to change power level (and therefore field strength) after receiving $PLI_{ATQ}$ from a PICC |      |
| Support of $PLI_{CID}$ handling | Ability to change power level (and therefore field strength) after receiving $PLI_{CID}$ from a PICC |      |

"

Page 8, 4.8, Table 6

Replace Table 6 with the following table:

"

**Table 6 — PICC manufacturer information**

| Parameter                                                            | Description                                                                                                                    | Unit |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------|
| Location, center and size of the antenna                             | Drawing with dimensions of the PICC outside shape and the position of the external rectangle/circle of the claimed PICC class. |      |
| PICC class (optional) <sup>a</sup>                                   | Claimed PICC class                                                                                                             |      |
| Resonance frequency range (optional)                                 | Minimum and maximum resonance frequency                                                                                        | MHz  |
| Communication signal interface                                       | Supported communication signal interface(s):<br>— Type A<br>— Type B<br>— Type A and Type B                                    |      |
| <sup>a</sup> If not provided, test methods for Class 1 shall be used |                                                                                                                                |      |

Table 6 (continued)

| Parameter                                                            | Description                                                                         | Unit  |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------|
| Temperature range                                                    | Minimum and maximum temperature values                                              | °C    |
| Supported $PLI_{ATQ}$ values                                         | List of supported optional $PLI_{ATQ}$ values in Answer to Request                  |       |
| Supported $PLI_{CID}$ values                                         | List of supported optional $PLI_{CID}$ values in CID field                          |       |
| PCD to PICC supported bit rates                                      | List of supported optional PCD to PICC bit rates                                    |       |
| PICC to PCD supported bit rates                                      | List of supported optional PICC to PCD bit rates                                    |       |
| Same bit rate for both directions                                    | Indication if only same bit rate from PCD to PICC and from PICC to PCD is supported |       |
| Random or fixed UID (Type A) or PUPI (Type B)                        | Indication whether the UID (Type A) or PUPI (Type B) is random or fixed             |       |
| Maximum frame size supported                                         | Maximum frame size in reception                                                     | bytes |
| PCD to PICC frame with error correction supported                    | Frame with error correction from PCD to PICC                                        |       |
| PICC to PCD frame with error correction supported                    | Frame with error correction from PICC to PCD                                        |       |
| TEST_COMMAND_SEQUENCE1                                               | See 0.2.1                                                                           |       |
| TEST_COMMAND1                                                        | See 0.2.1                                                                           |       |
| TEST_COMMAND2                                                        | See 0.2.1                                                                           |       |
| TEST_COMMAND3                                                        | See 0.2.1                                                                           |       |
| TEST_COMMAND4                                                        | See 0.2.1                                                                           |       |
| <sup>a</sup> If not provided, test methods for Class 1 shall be used |                                                                                     |       |

"

Page 38, 7.1.9

Add the following subclause after 7.1.8.3:

"

## 7.1.9 Procedures for PCD supporting optional $PLI_{ATQ}$ or $PLI_{CID}$ handling

### 7.1.9.1 Scope

These tests apply only to PCDs which support  $PLI_{ATQ}$  or  $PLI_{CID}$  handling.

If the PCD supports optional  $PLI_{ATQ}$  or  $PLI_{CID}$  handling, the additional procedures specified in 7.1.9.2, 7.1.9.3, 7.1.9.4 and H.5 shall be used to verify that, for every power level used by the PCD:

- the PCD complies with the field strength requirements specified in ISO/IEC 14443-2:2020/Amd 1, ISO/IEC 14443-3:2018/Amd 1 and ISO/IEC 14443-4:2018/Amd 1;
- the PCD complies with modulation index and waveform requirements specified in ISO/IEC 14443-2;
- the PCD complies with load modulation reception requirements specified in ISO/IEC 14443-2;
- the PCD complies with EMD immunity requirements specified in ISO/IEC 14443-2.

### 7.1.9.2 Modulation index and waveform

The steps c) to g) of the procedure specified in 7.1.4.2 shall be repeated for every power level between minimum and maximum power level obtained by  $PLI_{ATQ}$  or  $PLI_{CID}$ .

For each power level, the test report shall be as specified in 7.1.4.3.

### 7.1.9.3 Load modulation reception

The procedures specified in 7.1.6.5 and 7.1.6.6 shall be repeated for every power level between minimum and maximum power level obtained by  $PLI_{ATQ}$  or  $PLI_{CID}$ .

For each power level, the test report shall be as specified in 7.1.6.7.

### 7.1.9.4 PCD EMD immunity test

The steps b) to l) of the procedure specified in 7.1.8.2 shall be repeated for every power level between minimum and maximum power level obtained by  $PLI_{ATQ}$  or  $PLI_{CID}$ .

For each power level, the test report shall be as specified in 7.1.8.3.

"

Page 38, 7.2.1.1

Replace the text with the following:

"The purpose of this test is to verify that the load modulation amplitude  $V_{LMA}$  of the PICC and the phase parameters  $\emptyset_{LM, INTER}$  and  $\emptyset_{LM, INTRA}$  of the PICC conform to ISO/IEC 14443-2 for all mandatory and supported optional PICC to PCD bit rates within the operating field range [ $H_{min}$  respectively  $H_{LP}$  if the PICC supports  $PLI_{ATQ}$  or  $PLI_{CID}$ ,  $H_{max}$ ]."

Page 40, 7.2.2.1

Replace the text with the following:

"The purpose of this test is to determine that the PICC does not generate an electromagnetic disturbance amplitude  $V_{EMD}$  higher than  $V_{E, PICC}$  during  $t_{E, PICC}$  with the exceptions defined in ISO/IEC 14443-2 within the operating field range [ $H_{min}$  respectively  $H_{LP}$  if the PICC supports  $PLI_{ATQ}$  or  $PLI_{CID}$ ,  $H_{max}$ ] as specified in ISO/IEC 14443-2 for all supported PICC to PCD bit rates.

NOTE 1 The low EMD time  $t_{E, PICC}$  is a function of FDT/TR0 as defined in ISO/IEC 14443-3:2018, 8.2.

NOTE 2 The EMD limit  $V_{E, PICC}$  is a function of the field strength.

"

Page 41, 7.2.3.1

Replace the text with the following:

"The purpose of this test is to verify the ability of the PICC to receive the PCD commands within the operating field range [ $H_{min}$  respectively  $H_{LP}$  if the PICC supports  $PLI_{ATQ}$  or  $PLI_{CID}$ ,  $H_{max}$ ] as specified in ISO/IEC 14443-2 for all supported PCD to PICC bit rates."

Page 45, 7.2.5.1

Replace the text with the following:

"This test is used to measure the PICC loading effect at the minimum operating field strength  $H_{min}$  respectively  $H_{LP}$  if the PICC supports  $PLI_{ATQ}$  or  $PLI_{CID}$  as specified in ISO/IEC 14443-2."

Page 45, 7.2.5.2

Add the following paragraph after the 3<sup>rd</sup> paragraph:

"If the PICC supports  $PLI_{ATQ}$  or  $PLI_{CID}$ , the test shall be repeated at a field strength of  $H_{LP}$ , with the Reference PICC having R2 value, or alternatively the applied voltage on CON2, set for a field strength of  $H_{LP}$ ."

Page 46, 7.2.6.1

Replace the text with the following:

"This test verifies that the PICC operates as intended within the operating field range [ $H_{min}$  respectively  $H_{LP}$  if the PICC supports  $PLI_{ATQ}$  or  $PLI_{CID}$ ,  $H_{max}$ ] as specified in ISO/IEC 14443-2 for all supported PCD to PICC bit rates."

Page 47, 7.2.7

Add the following subclause after 7.2.6.4:

"

## 7.2.7 Procedures for PICC supporting optional $PLI_{ATQ}$ or $PLI_{CID}$ values

### 7.2.7.1 Scope

These tests apply only to PICCs which support  $PLI_{ATQ}$  or  $PLI_{CID}$  values.

If the PICC supports optional  $PLI_{ATQ}$  or  $PLI_{CID}$  values, the additional procedures specified in 7.2.1, 7.2.2, 7.2.3, 7.2.5 and 7.2.6 and the additional procedures specified in 7.2.7.2 to 7.2.7.4 shall be used to verify that:

- the PICC complies with the requirements specified in ISO/IEC 14443-2:2020/Amd 1, ISO/IEC 14443-3:2018/Amd 1 and ISO/IEC 14443-4:2018/Amd 1;
- the PICC complies with the transmission requirements specified in ISO/IEC 14443-2 for a field strength of  $H_{LP}$ ;
- the PICC complies with the EMD level and low EMD time requirements specified in ISO/IEC 14443-2 and ISO/IEC 14443-3 for a field strength of  $H_{LP}$ ;
- the PICC complies with the reception requirements specified in ISO/IEC 14443-2 for a field strength of  $H_{LP}$ ;
- the PICC complies with the maximum loading effect requirements specified in 7.2.5 for a field strength of  $H_{LP}$ ;
- the PICC complies with operating field strength requirements specified in 7.2.6 for a field strength of  $H_{LP}$ .

### 7.2.7.2 Determination of PICC minimum requested field strength $H_{LP}$

The following sequence is applied to determine the minimum field strength  $H_{LP}$  that the PICC may request and at which it shall comply with all ISO/IEC 14443 requirements.

- Find the minimum field strength at which the PICC still indicates that its received field strength is at least  $(H_{LP} + H_{step, max})$ , with a resolution of 0,1 dB (a factor of  $\sim 1,012$ ).  $H_{step, max}$  is specified in ISO/IEC 14443-2:2020/Amd 1:2021, 6.3.



NOTE This can be achieved by decreasing the Test PCD assembly field strength by steps of 0,1 dB while the PICC indicates its received field strength is at least  $(H_{LP} + H_{step, max})$  or by using a dichotomic search.

- b) Obtain  $H_{LP}$  by subtracting  $H_{step, max}$  to the minimum field strength at which the PICC still indicates that its received field strength is at least  $(H_{LP} + H_{step, max})$ .

### 7.2.7.3 Maximum field strength change test using $PLI_{ATQ}$

#### 7.2.7.3.1 General

This subclause verifies PICC operation after worst case field strength steps following  $PLI_{ATQ}$  indication.

#### 7.2.7.3.2 Procedure

Perform the following steps for single step up:

- Adjust the RF power delivered by the signal generator to the Test PCD antenna to produce the PICC minimum requested field strength  $H_{LP}$  as measured by the calibration coil.
- Place the PICC under test into the DUT position. The RF drive into the Test PCD antenna shall be readjusted to the required field strength if necessary.
- Send a REQA for PICC Type A or a REQB(AFI, N=1) for PICC Type B.
- If  $PLI_{ATQ}$  in the PICC response is not (00)b then send a step increase of  $H_{step, max}$  to the Test PCD assembly power amplifier to set the Test PCD assembly field strength with minimum achievable rise/fall time.
- Immediately after a guard time of  $t_{PL}$  (as specified in ISO/IEC 14443-3:2018/Amd 1:2021, 6.5.2.3), send start of communication or SOF of the next anticollision command, AC for PICC Type A or ATTRIB(PUPI) for PICC Type B.
- Check that the PICC response is as expected.
- Put the PICC in IDLE state by sending a REQA for PICC Type A or a DESELECT and a WUPB(nAFI) for PICC Type B.

NOTE 1 If the PICC Type B is not compliant with ISO/IEC 14443-4, then commands used in steps e) and g) can be modified, e.g. using HLTB(PUPI) in step e) and WUPB(nAFI) in step g).

- h) Repeat steps c) to g) until the Test PCD assembly field strength is  $H_{max}$ , using a smaller value for the last step increase if necessary, or until  $PLI_{ATQ}$  is (00)b at step d).

Perform the following steps for single step down:

- Adjust the RF power delivered by the signal generator to the Test PCD antenna to produce the PICC maximum field strength  $H_{max}$  as measured by the calibration coil.
- Send a REQA for PICC Type A or a REQB(AFI, N=1) for PICC Type B.
- If  $PLI_{ATQ}$  is (11)b then send a step decrease of  $H_{step, max}$  to the Test PCD assembly power amplifier to set the Test PCD assembly field strength with minimum achievable rise/fall time.
- Immediately after a guard time of  $t_{PL}$ , send start of communication or SOF of the next anticollision command, AC for PICC Type A or ATTRIB(PUPI) for PICC Type B.
- Check that the PICC response is as expected.
- Put the PICC in IDLE state by sending a REQA for PICC Type A or a DESELECT and a WUPB(nAFI) for PICC Type B.

NOTE 2 If the PICC Type B is not compliant with ISO/IEC 14443-4, then commands used in steps l) and n) can be modified, e.g. using HLTB(PUPI) in step l) and WUPB(nAFI) in step n).

- o) Repeat steps j) to n) until  $PLI_{ATQ}$  is not (11)b at step k).

Perform the following steps for multiple step up:

- p) Adjust the RF power delivered by the signal generator to the Test PCD antenna to produce the PICC minimum requested field strength  $H_{LP}$  as measured by the calibration coil.
- q) Send a REQA for PICC Type A or a REQB(AFI, N=1) for PICC Type B.
- r) If  $PLI_{ATQ}$  is not (00)b then send several consecutive steps increase of  $H_{step, max}$  to the Test PCD assembly power amplifier to set the Test PCD assembly field strength with minimum achievable rise/fall time, each step increase being followed by a guard time of  $t_{PL}$ , up to a field strength of  $H_{max}$  as measured by the calibration coil.

NOTE 3 The last step increase can have a smaller value to reach exactly  $H_{max}$ .

- s) Immediately after the last guard time of  $t_{PL}$ , send start of communication or SOF of the next anticollision command, AC for PICC Type A or ATTRIB(PUPI) for PICC Type B.
- t) Check that the PICC response is as expected.

NOTE 4 In any step of this procedure,  $t_{PL}$  can be set to a non-default value by  $PLI_{ATQ}$ . This new current value applies until a subsequent setting or until the end of the procedure as the PICC is never reset to POWER-OFF state during the procedure.

### 7.2.7.3.3 Test report

The test is PASS if the PICC response in steps f), m) and t) is as expected, otherwise the test is FAIL.

### 7.2.7.4 Maximum field strength change test using $PLI_{CID}$

#### 7.2.7.4.1 General

This subclause verifies PICC operation after worst case field strength steps following  $PLI_{CID}$  indication.

#### 7.2.7.4.2 Procedure

Perform the following steps for single step up:

- a) Adjust the RF power delivered by the signal generator to the Test PCD antenna to produce the PICC minimum requested field strength  $H_{LP}$  as measured by the calibration coil.
- b) Place the PICC under test into the DUT position. The RF drive into the Test PCD antenna shall be readjusted to the required field strength if necessary.
- c) Put the PICC in PROTOCOL state and initiate a first I-block exchange.
- d) If  $PLI_{CID}$  in the PICC response is not (00)b then send a step increase of  $H_{step, max}$  to the Test PCD assembly power amplifier to set the Test PCD assembly field strength with minimum achievable rise/fall time.
- e) Immediately after a guard time of  $t_{PL}$  (as specified in ISO/IEC 14443-4:2018/Amd 1:2021, 7.5), send start of communication or SOF of the next block.
- f) Check that the PICC response is as expected.
- g) Repeat steps d) to f) until the Test PCD assembly field strength is  $H_{max}$ , using a smaller value for the last step increase if necessary, or until  $PLI_{CID}$  is (00)b at step d).

Perform the following steps for single step down:

- h) Adjust the RF power delivered by the signal generator to the Test PCD antenna to produce the PICC maximum field strength  $H_{max}$  as measured by the calibration coil.

- i) Initiate an I-block exchange.
- j) If  $PLI_{CID}$  is (10)b or (11)b then send a step decrease of  $H_{step, max}$  to the Test PCD assembly power amplifier to set the Test PCD assembly field strength with minimum achievable rise/fall time.
- k) Immediately after a guard time of  $t_{PL}$ , send start of communication or SOF of the next block.
- l) Check that the PICC response is as expected.
- m) Repeat steps j) to l) until  $PLI_{CID}$  is neither (10)b nor (11)b at step j).

Perform the following steps for multiple step up:

- n) Adjust the RF power delivered by the signal generator to the Test PCD antenna to produce the PICC minimum requested field strength  $H_{LP}$  as measured by the calibration coil.
- o) Initiate an I-block exchange.
- p) If  $PLI_{CID}$  is not (00)b then send several consecutive steps increase of  $H_{step, max}$  to the Test PCD assembly power amplifier to set the Test PCD assembly field strength with minimum achievable rise/fall time, each step increase being followed by a guard time of  $t_{PL}$ , up to a field strength of  $H_{max}$  as measured by the calibration coil.

NOTE 1 The last step increase can have a smaller value to reach exactly  $H_{max}$ .

- q) Immediately after the last guard time of  $t_{PL}$ , send start of communication or SOF of the next block.
- r) Check that the PICC response is as expected.

NOTE 2 In any step of this procedure,  $t_{PL}$  can be set to a non-default value by  $PLI_{ATQ}$  or by S(WTX). This new current value applies until a subsequent setting or until the end of the procedure as the PICC is never reset to POWER-OFF state during the procedure.

#### 7.2.7.4.3 Test report

The test is PASS if the PICC response in steps f), l) and r) is as expected, otherwise the test is FAIL.

"

Page 240, H.5

Add the following subclause after H.4.5.4 and renumber the subsequent subclauses and tables:

"

### H.5 Handling of $PLI_{ATQ}$ or $PLI_{CID}$

#### H.5.1 General

The purpose of this test is to determine the handling of  $PLI_{ATQ}$  or  $PLI_{CID}$  according to ISO/IEC 14443-3:2018/Amd 1:2021, 6.5.2.3 and ISO/IEC 14443-4:2018/Amd 1:2021, 7.5. This test shall be executed with reference PICCs corresponding to all mandatory and optionally supported classes.

#### H.5.2 Apparatus

See H.1.

#### H.5.3 Procedure

Place the LT into the PCD operating volume and record the presence and the content of the PCD commands.