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## **Identification cards — Contactless integrated circuit(s) cards - Proximity cards — Part 3: Initialization and anticollision**

### **AMENDMENT 4: Electromagnetic disturbance handling**

*Cartes d'identification — Cartes à circuit(s) intégré(s) sans contact - Cartes de proximité — Partie 3: Initialisation et anticollision*

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### **AMENDEMENT 4: Gestion de perturbation électromagnétique**

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Amendment 4 to ISO/IEC 14443-3:2010 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, Cards and personal identification.



## Identification cards — Contactless integrated circuit(s) cards - Proximity cards — Part 3: Initialization and anticollision

### AMENDMENT 4: Electromagnetic disturbance handling

*Page 3, clause 4*

Insert the following new symbols:

$t_{E,PICC}$  Low EMD time, PICC

$t_{E,PCD}$  Low EMD time, PCD

*Page 22, clause 6.5.4*

Replace Table 11 by the following table:

"

**Table 1 — Single size UIDs**

uid0	Description
'08'	uid1 to uid3 is a random number which is dynamically generated
'x0' - 'x7', 'x9' - 'xE', '18', '28', '38', '48', '58', '68', '78', '98', 'A8', 'B8', 'C8', 'D8', 'E8'	Proprietary number
'F8'	RFU
'xF'	Fixed number, non-unique

"

*Page 48*

Insert the following new clause 8 after clause 7:

## 8 Electromagnetic disturbance handling

This clause enhances the robustness of the contactless communication between PCD and PICC against PICC generated electromagnetic disturbance.

While the PCD is waiting for the PICC response, the PICC is processing the requested command. The PICC dynamic current consumption during execution time may cause an arbitrary load (which may not be purely resistive) modulation effect on the magnetic field. In some cases the PCD may misinterpret EMD as data sent by the PICC and this may negatively impact proper reception of the PICC response.

The effect of the EMD on the PCD reception may depend on

- the PICC operation and speed,
- the PCD and PICC antenna geometries and relative distance (coupling factor),
- the sensitivity of PCD receiver channel.

This clause improves the robustness of the contactless communication from PICC to PCD by

- defining EMD handling timing constraints for PICC and for PCD,
- recommending a PCD algorithm for EMD handling.

### 8.1 EMD handling timing constraints

The low EMD time  $t_{E,PICC}$  is the time period before the start of PICC data transmission, when the PICC shall not produce an EMD level higher than the EMD limit as defined in ISO/IEC 14443-2/Amd.3.

This low EMD time  $t_{E,PICC}$  has a value of  $F - 1024/f_c$  with a maximum value of  $1408/f_c$  where  $F$  equals FDT for Type A and TR0 for Type B. The minimum value is  $0/f_c$  for  $TR0 \leq 1024/f_c$ .

The low EMD time  $t_{E,PCD}$  is the time period to allow the PCD to recover from electromagnetic disturbances.

The PCD shall be ready to process a PICC frame no later than  $t_{E,PCD}$  after the last time the EMD level was above the EMD limit as defined in ISO/IEC 14443-2/Amd.3.

This low EMD time  $t_{E,PCD}$  has a value of  $F - 1044/f_c$  with a maximum value of  $1388/f_c$  where  $F$  equals FDT for Type A and TR0 for Type B. The minimum value is  $0/f_c$  for  $TR0 \leq 1044/f_c$ .

NOTE The minimum value of 0 for  $t_{E,PICC}$  and  $t_{E,PCD}$  may only be reached when the PCD indicates support of a TR0 shorter than the default value ( $64/f_s$ ) (see ISO/IEC 14443-3, 7.10.3.1).

The low EMD time for PCD and PICC are illustrated in Figure 33.

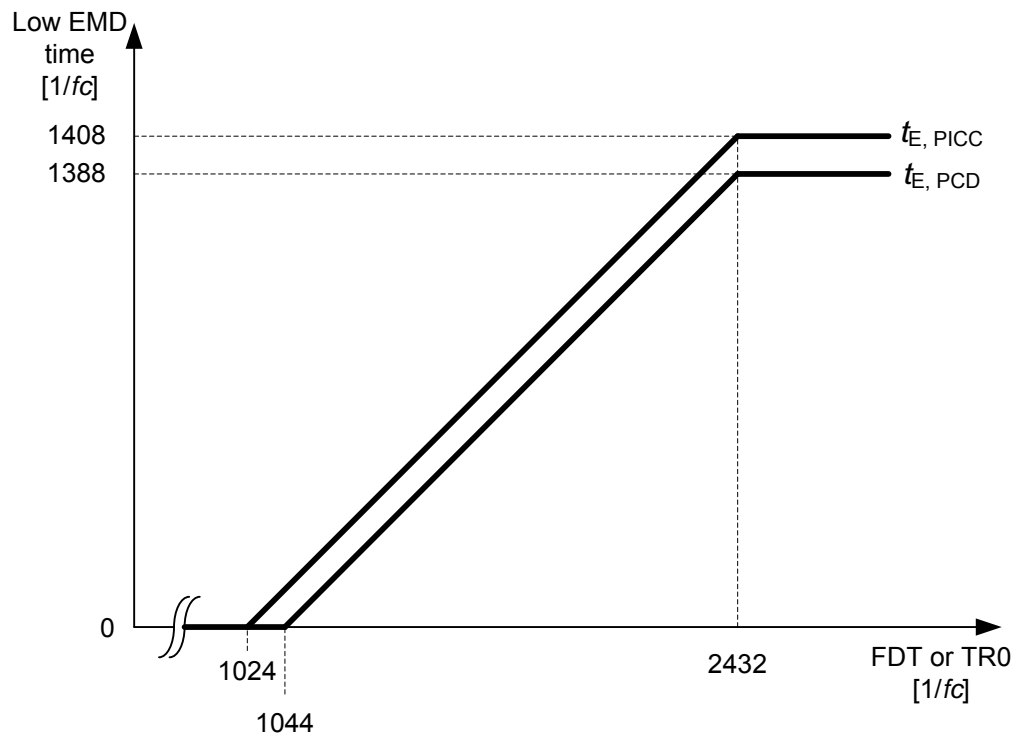


Figure 33 — Low EMD time

## 8.2 Recommendations for a PCD EMD handling algorithm

As it is important for a PCD to distinguish between EMD and frame reception errors, the following PCD recommendations are defined to maximize the EMD rejection while applying error detection and recovery as defined in ISO/IEC 14443-4. They do not apply to anticollision procedure Type A nor when a protocol different from ISO/IEC 14443-4 is used.

When the PCD is ready to start receiving the PICC frame it should continuously check for frame errors (SOF, Start and Stop bits, Parity bits, EOF). As soon as an error occurs:

- if the number of supposed received bytes is less than  $3^{1)}$ , the PCD should consider them as EMD and should restart its reception process;
- else the PCD should continue the reception process then apply the error detection and recovery when the whole frame has been received.

**NOTE** To avoid unnecessary reception of EMD, PCDs need not be ready to start receiving PICC frames less than  $1044/f_c$  after the end of their command frames (unless for Type B when minimum TR0 has been reduced).

1) The condition that invalid packets of lengths less than 3 bytes should be qualified as EMD should be adapted for specific applications. Packet lengths of a few bits up to several bytes may be used as decision criteria to optimize performance.