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**ISO/IEC 14443-2:2010/FPDAM 4.3**

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## **Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface**

**AMENDMENT 4**  
Additional PICC classes

*Cartes d'identification — Cartes à circuit intégré sans contact — Cartes de proximité — Partie 2: Interface radio fréquence*

*AMENDEMENT 4*  
*Classes de PICC additionnelles*

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Amendment 4 to ISO/IEC 14443-2:2010 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.



## Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface

### AMENDMENT 4: Additional PICC classes

*Page 3 of ISO/IEC 14443-2:2010, Clause 4*

Add the following symbol definitions:

$V_{LMA, PCD}$	Minimum load modulation amplitude for PCD reception
$V_{LMA, PICC}$	Minimum load modulation amplitude for PICC transmission

*Page 4 of ISO/IEC 14443-2:2010, Clause 6*

Replace 6.2 by the following subclause:

#### **6.2 Operating field strength**

The PCD shall generate a field strength of at least  $H_{min}$  and not exceeding  $H_{max}$  at manufacturer specified positions (operating volume) under unmodulated conditions.

The PCD

- shall support PICCs of "Class 1", "Class 2" and "Class 3";
- may optionally support PICCs of "Class 4";
- may optionally support PICCs of "Class 5";
- and may optionally support PICCs of "Class 6".

PCD requirements measured with Reference PICCs 1, 2 and 3 are mandatory for all PCDs.

PCD requirements measured with Reference PICC 4 are only mandatory for PCDs supporting operation with "Class 4" PICCs.

PCD requirements measured with Reference PICC 5 are only mandatory for PCDs supporting operation with "Class 5" PICCs.

PCD requirements measured with Reference PICC 6 are only mandatory for PCDs supporting operation with "Class 6" PICCs.

Table 1 — PCD field strength

	PCD	
	$H_{min}$	$H_{max}$
Measured with Reference PICC 1	1,5 A/m (rms)	7,5 A/m (rms)
Measured with Reference PICC 2	1,5 A/m (rms)	8,5 A/m (rms)
Measured with Reference PICC 3	1,5 A/m (rms)	8,5 A/m (rms)
Measured with Reference PICC 4 (optional)	2,0 A/m (rms)	12 A/m (rms)
Measured with Reference PICC 5 (optional)	2,5 A/m (rms)	14 A/m (rms)
Measured with Reference PICC 6 (optional)	4,5 A/m (rms)	18 A/m (rms)

The PCD shall not generate a field strength higher than the values specified for all mandatory and optional classes in ISO/IEC 14443-1:2008/Amd.1:2010, 4.4 (alternating magnetic field) in any possible PICC position and orientation, measured with the associated Reference PICCs.

Test methods for the PCD operating field are defined in ISO/IEC 10373-6 and use a dedicated Reference PICC for each class.

NOTE 1 Although field measurements with some Reference PICCs may show values higher than 7,5 A/m (rms), the new  $H_{max}$  limits specified in Table 1 do not allow PCDs to produce higher field strength than with first edition of ISO/IEC 14443-2. This is because PCD field distribution is usually not homogenous within the operating volume and References PICCs have different measurement areas.

If the PICC meets the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then the PICC shall operate as intended continuously between  $H_{min}$  and  $H_{max}$  defined for its class; this includes all PICC requirements defined in this standard and processing of the manufacturer specified set of commands.

If the PICC does not claim to meet the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then:

- if the PICC antenna fits within the external rectangle defined in "Class 2" as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then:
  - the PICC shall operate as intended continuously between  $H_{min}$  and  $H_{max}$  defined for "Class 2",
  - the PICC shall pass the loading effect test defined for "Class 2";
- if the PICC antenna fits within the external rectangle or external circle defined in "Class 3" as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then:
  - the PICC shall operate as intended continuously between  $H_{min}$  and  $H_{max}$  defined for "Class 3",
  - the PICC shall pass the loading effect test defined for "Class 3";
- if the PICC antenna does not claim to fit within the external rectangle or external circle defined in "Class 2" or "Class 3" as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then:
  - the PICC shall operate as intended continuously between  $H_{min}$  and  $H_{max}$  defined for "Class 1",
  - the PICC shall pass the loading effect test defined for "Class 1".

NOTE 2 If the PICC does not claim to meet the requirements of one particular class then the requirements defined above may not be sufficient to guarantee proper operation and interoperability with PCDs.

Table 2 — PICC operating field strength

	PICC	
	$H_{\min}$	$H_{\max}$
"Class 1" PICC	1,5 A/m (rms)	7,5 A/m (rms)
"Class 2" PICC	1,5 A/m (rms)	8,5 A/m (rms)
"Class 3" PICC	1,5 A/m (rms)	8,5 A/m (rms)
"Class 4" PICC	2,0 A/m (rms)	12 A/m (rms)
"Class 5" PICC	2,5 A/m (rms)	14 A/m (rms)
"Class 6" PICC	4,5 A/m (rms)	18 A/m (rms)

NOTE 3 Margins of field strength are effectively included by the test methods as specified in ISO/IEC 10373-6.

Page 15 of ISO/IEC 14443-2:2010, 8.2

Replace 8.2.2 by the following subclause and renumber all subsequent tables:

### 8.2.2 Load modulation

The PICC shall be capable of communication to the PCD via an inductive coupling area where the carrier frequency is loaded to generate a subcarrier with frequency  $f_s$ . The subcarrier shall be generated by switching a load in the PICC.

If the PICC meets the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then the load modulation amplitude  $V_{LMA}$  of the PICC shall be at least  $V_{LMA, PICC}$  specified for its class when measured as described in ISO/IEC 10373-6, using the test PCD assembly defined for its class, where  $H$  is the value of magnetic field strength in A/m (rms).

If the PICC does not claim to meet the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2010, then the load modulation amplitude  $V_{LMA}$  of the PICC shall be at least  $V_{LMA, PICC}$  specified for "Class 1" when measured as described in ISO/IEC 10373-6, using the test PCD assembly defined for "Class 1", where  $H$  is the value of magnetic field strength in A/m (rms).

Table 8 specifies for each PICC class both the load modulation amplitude limit  $V_{LMA, PICC}$  and the relevant test PCD assembly to measure the PICC load modulation amplitude  $V_{LMA}$ .

Table 8 — PICC load modulation amplitude limit

	PICC	
	$V_{LMA, PICC}$	Test PCD assembly
"Class 1" PICC	$22/H^{0,5}$ [mV (peak)]	Test PCD assembly 1
"Class 2" PICC	Min(14 ; $22/H^{0,5}$ ) [mV (peak)]	Test PCD assembly 1
"Class 3" PICC	Min(14 ; $22/H^{0,5}$ ) [mV (peak)]	Test PCD assembly 1
"Class 4" PICC	Min(18 ; $40/H^{0,5}$ ) [mV (peak)]	Test PCD assembly 2
"Class 5" PICC	Min(14 ; $34/H^{0,5}$ ) [mV (peak)]	Test PCD assembly 2
"Class 6" PICC	Min(7 ; $26/H^{0,5}$ ) [mV (peak)]	Test PCD assembly 2



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The PCD shall be able to receive a  $V_{LMA}$  of at least  $V_{LMA, PCD}$  when measured as described in ISO/IEC 10373-6, using test PCD assembly 1, with Reference PICCs 1, 2 and 3, where  $H$  is the value of magnetic field strength in A/m (rms).

If the PCD supports operation with "Class 4" PICCs, it shall be able to receive a  $V_{LMA}$  of at least  $V_{LMA, PCD}$  when measured as described in ISO/IEC 10373-6, using test PCD assembly 2, with Reference PICC 4, where  $H$  is the value of magnetic field strength in A/m (rms).

If the PCD supports operation with "Class 5" PICCs, it shall be able to receive a  $V_{LMA}$  of at least  $V_{LMA, PCD}$  when measured as described in ISO/IEC 10373-6, using test PCD assembly 2, with Reference PICC 5, where  $H$  is the value of magnetic field strength in A/m (rms).

If the PCD supports operation with "Class 6" PICCs, it shall be able to receive a  $V_{LMA}$  of at least  $V_{LMA, PCD}$  when measured as described in ISO/IEC 10373-6, using test PCD assembly 2, with Reference PICC 6, where  $H$  is the value of magnetic field strength in A/m (rms).

Table 9 specifies for each Reference PICC both the load modulation reception limit  $V_{LMA, PCD}$  and the test PCD assembly to use to measure the PCD sensitivity.

**Table 9 — PCD load modulation reception limit**

	PCD	
	$V_{LMA, PCD}$	Test PCD assembly
Measured with Reference PICC 1	$20/H^{0.5}$ [mV (peak)]	Test PCD assembly 1
Measured with Reference PICC 2	$\text{Min}(12,5 ; 20/H^{0.5})$ [mV (peak)]	Test PCD assembly 1
Measured with Reference PICC 3	$\text{Min}(12,5 ; 20/H^{0.5})$ [mV (peak)]	Test PCD assembly 1
Measured with Reference PICC 4 (optional)	$\text{Min}(16 ; 36/H^{0.5})$ [mV (peak)]	Test PCD assembly 2
Measured with Reference PICC 5 (optional)	$\text{Min}(13 ; 31/H^{0.5})$ [mV (peak)]	Test PCD assembly 2
Measured with Reference PICC 6 (optional)	$\text{Min}(6 ; 23/H^{0.5})$ [mV (peak)]	Test PCD assembly 2

NOTE 1 The PICC load modulation amplitude limits of classes 2 to 6 are less strict than the previous PICC limit in ISO/IEC 14443-2:2010.

NOTE 2 For "Class 4", "Class 5" and "Class 6" PICCs, the use of test PCD assembly 2 increases the measured values of load modulation by a factor of approximately 2 compared with test PCD assembly 1.

Figure 11 to 15 are illustrations of the PCD and PICC load modulation amplitude limits for each class.

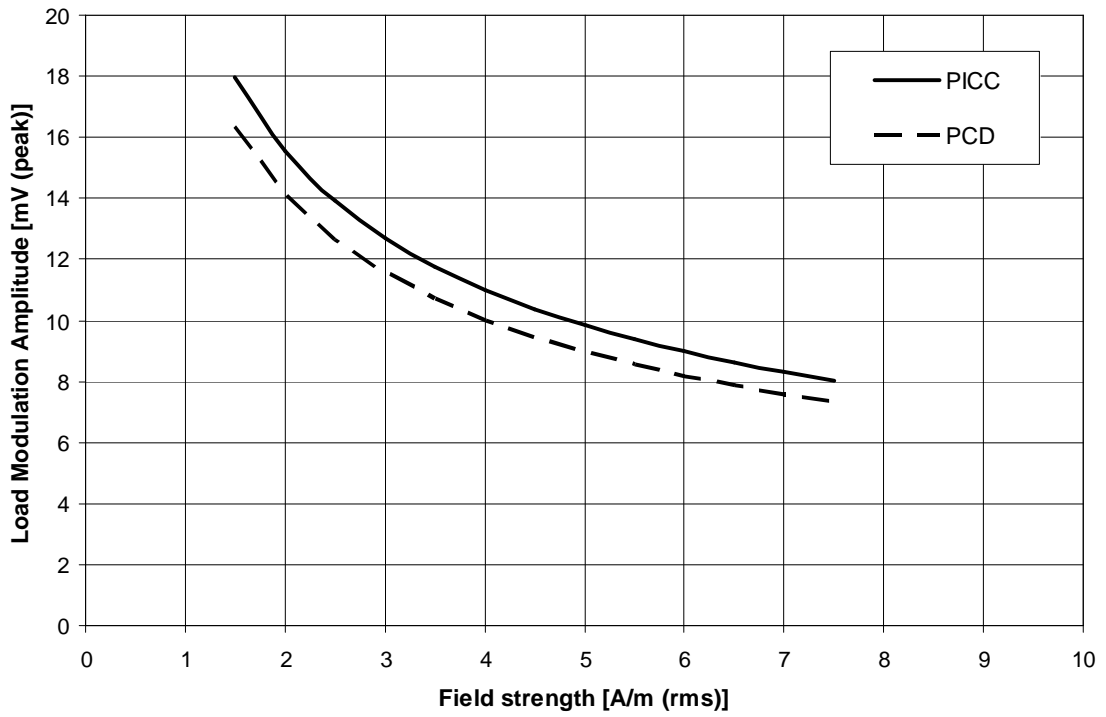


Figure 11 — Load modulation amplitude limits for "Class 1"

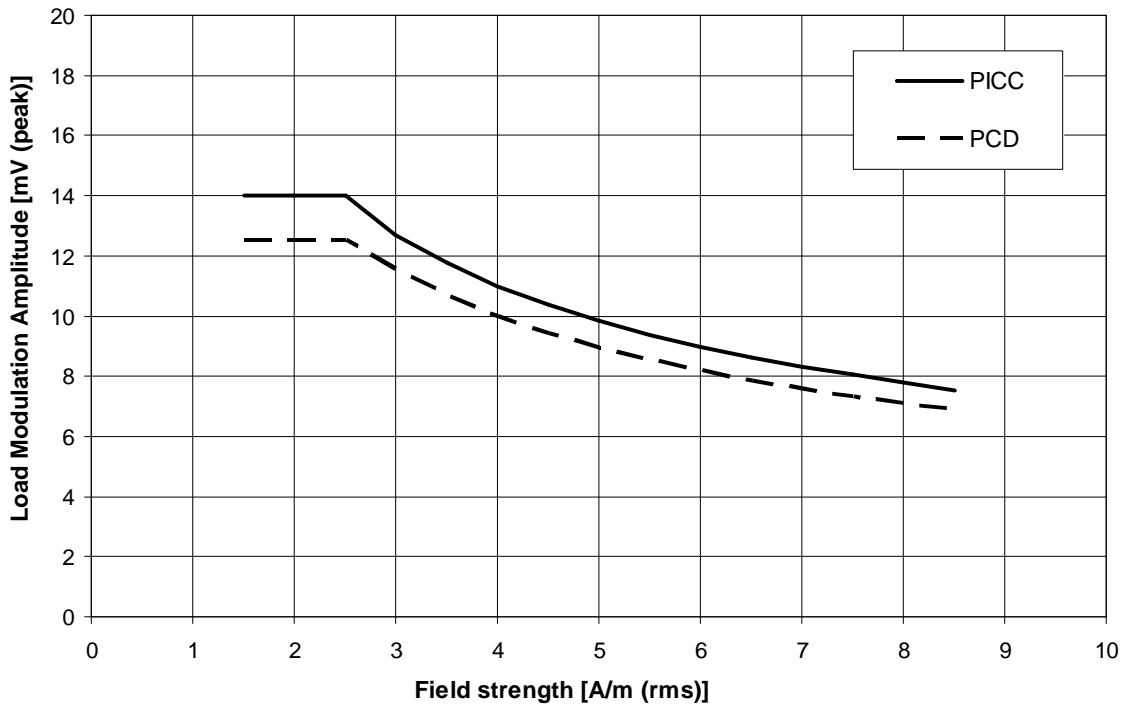


Figure 12 — Load modulation amplitude limits for "Class 2" and "Class 3"

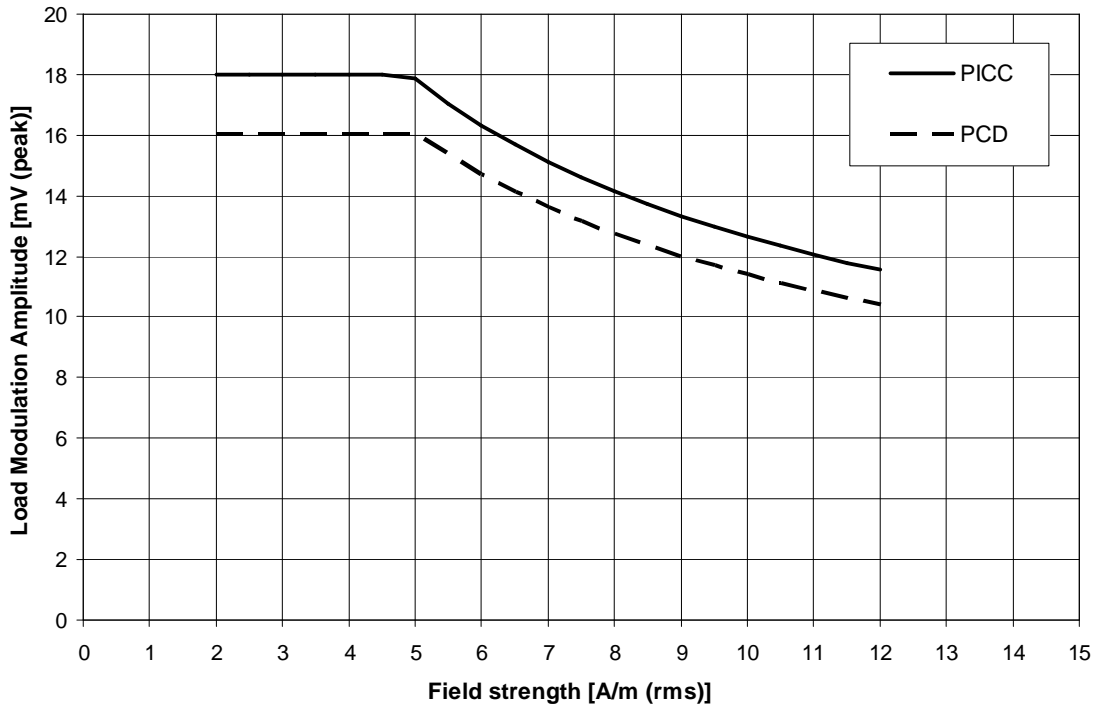


Figure 13 — Load modulation amplitude limits for "Class 4"

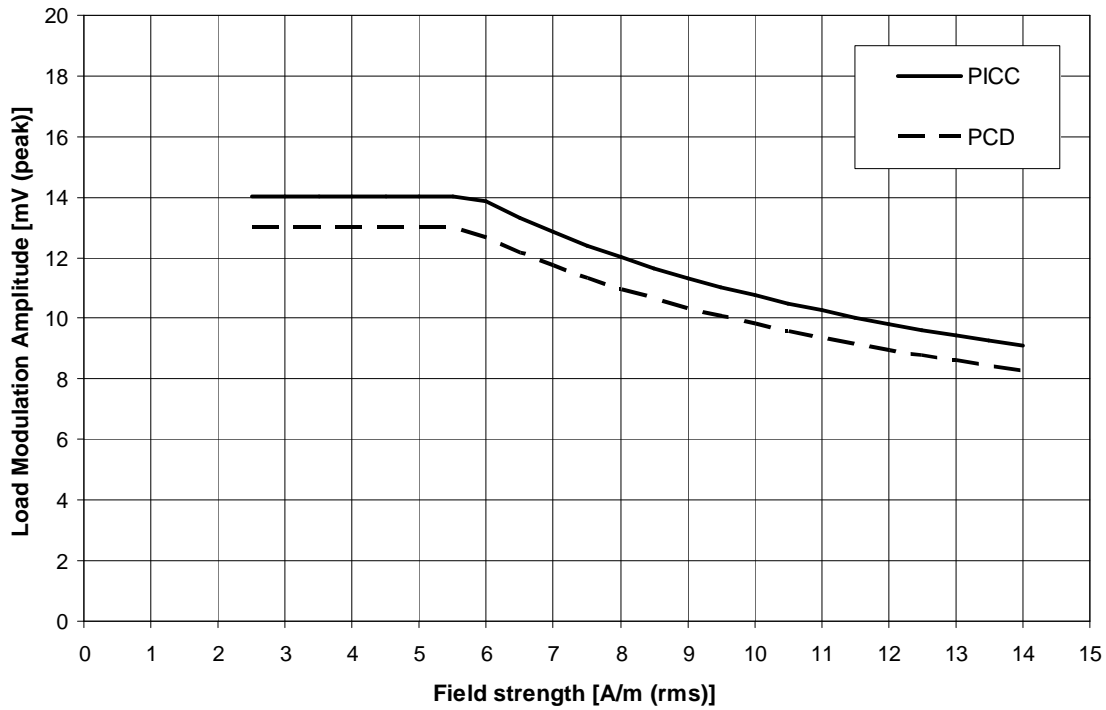


Figure 14 — Load modulation amplitude limits for "Class 5"

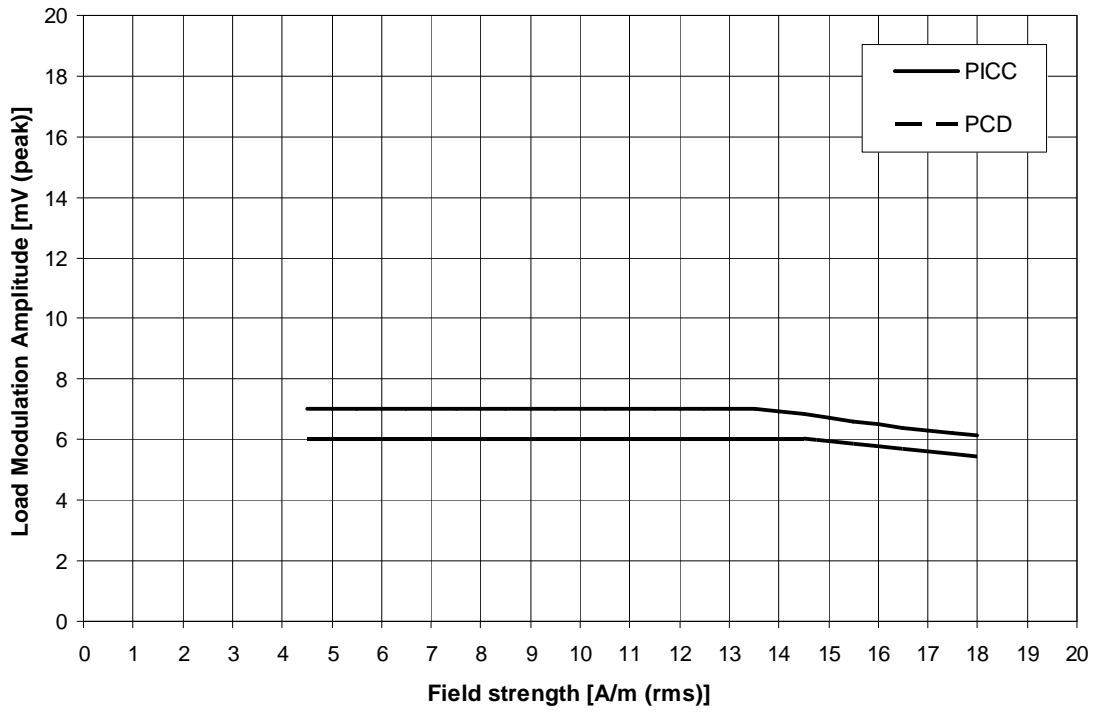


Figure 15 — Load modulation amplitude limits for "Class 6"