

Part-1: Physical characteristics

**1.0 Scope**

A physical specification with similar electronic characteristics of proximity integrated circuit cards (PICCs) such as those specified in ISO/IEC 14443 Part-2 and 3 but in thinner ID-1 (Card body) formats as defined within the selected card thickness of ISO/IEC 15457. Further, this Proposed Standard specifies construction attributes, pertaining to the materials, functionality and environmental requirements. This type of PICC is to be classified as a Limited Use (LU) PICC.

**1.A Purpose**

This Proposed Standard provides for LU PICCs that are designed to satisfy the need for a minimal cost contactless smart card or PICC as a form of electronic media. These LU's have limited features and lifecycle expectations while providing core electronic interface technology compatible to the established ISO/IEC 14443 standard PICCs designed to accommodate other application requirements. This class of PICC may be applied to Public Transit Systems requiring electronic ticketing, Building Security Access Systems as well as many other applications in North America that are not provided for through the international standards forum.

**2.0 Normative References**

The following normative document contain provisions that, through reference in this text, constitute provisions of this Part-1 of a Limited Use Proximity Integrated Circuit Card, ANSI XXXX standard. This standard may be viewed as complimentary to ISO 14443 PICCs Part-2 and Part-3 year 2001. For updated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 14443 –2 and 3, (Proximity Integrated Circuit Cards)

ISO/IEC 15457 –1 and 3, (Thin flexible cards)

**3.0 Terms and Definitions**

**3.1 Limited Use (LU) PICC:**

A proximity integrated circuit card that conforms to the requirements of low cost applications by limiting; functionality, construction complexity, lifecycle and security while maintaining interoperability with other standardized PICCs.

**3.2 Integrated circuit (IC):**

Electronic device or component(s) designed to perform processing, logic and/or memory functions

### **3.3 LU Contactless Integrated Circuit(s) Card**

A card of the type ID-1 (as specified in ISO/IEC 7810) as well as ID-1 with modified card body thickness and material construction per section four (4) of this document.

### **3.4 LU Proximity Card (PICC)**

A PICC of the card type ID-1 or ID-1 with thickness and construction material modifications into which integrated circuit(s) and coupling means have been placed and in which communication to such integrated circuit(s) is done by inductive coupling in proximity of a coupling device.

### **3.5 LU Proximity Coupling Device (PCD)**

The reader/writer device using inductive coupling to provide power to the PICC, as well as the control of data exchange with the PICC.

## **4.0 Physical Characteristics**

### **4.1 General**

The PICC shall have physical characteristics according to the requirements for the card ID-1 or Thin Flexible Cards specified in ISO/IEC 7810 and ISO/IEC 15457 of ID-1 format with thickness and construction material modifications per section 4.2.1 for Limited Use. Materials used to construct Limited Use PICCs are extended to beyond that of plastic materials.

### **4.2 Dimensions**

The nominal dimensions of the PICC shall be as for the ID-1 specified in ISO/IEC 7810 for all PICC types other than that of Limited Use type. The Limited Use card type shall have the nominal dimensions of an ID-1 with modified thickness per section 4.2.1.

#### **4.2.1 Physical Specification**

The Limited Use PICC shall have physical characteristics according to the requirements of the card type ID-1 with modifications to the thickness and construction materials specification. This specification in all cases uses the ID-1 “X” (Long) and “Y”(Short) dimensions of approximately 85mm x 54mm with ISO 7810 specified tolerances of X and Y per restated in Table 7. In addition, the thickness shall adopt the ISO/IEC 15457-1 & 3 Thin Flexible Card specifications were applicable but with modified thickness specification that classifies two distinct types (See Figures 1a, 1b, and 1c also see Table 6).

Identification cards – Contactless Integrated Circuits(s) Proximity Card- Limited Use cards

LU\_ID-1M (Identification Card Modified) with a thickness (z) of:  
400um (0.40mm) +/- 20.0um (0.020mm). See Figure 1a.

LU\_TFC.1 (Thin Flexible Card) with a thickness (z) of:  
270um (0.27 mm) +/- 16.0um (0.016mm). See Figure 1b.

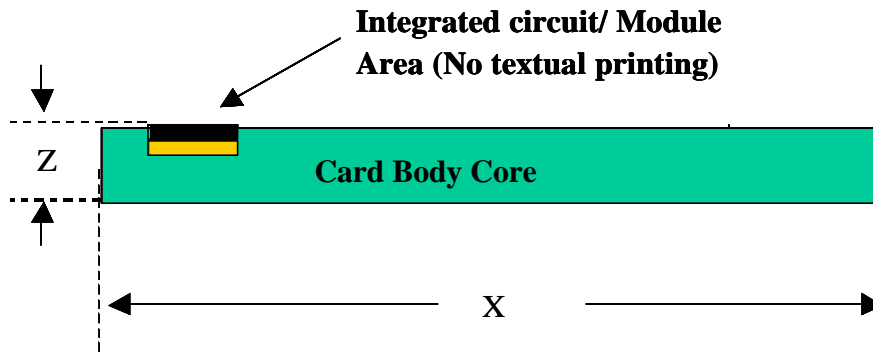


Figure 1a (LU ID-1M card format)

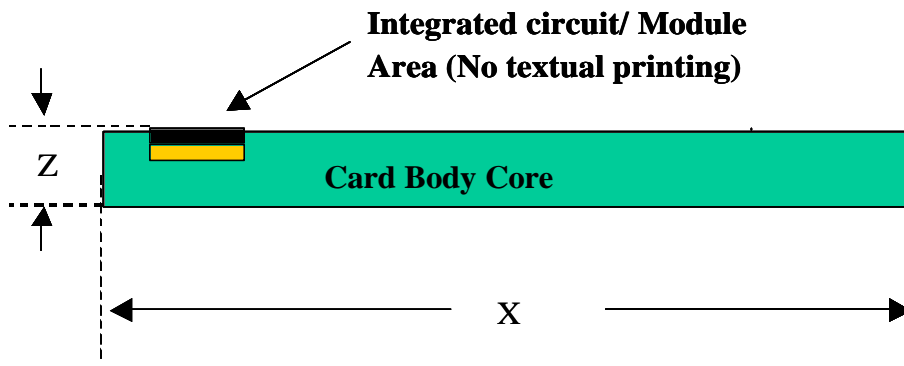


Figure 1b (LU\_TFC.1 card format)

The physical location of the contactless integrated circuit will be located within the X & Y dimensional area described in ISO 7810 for that of a contact module. The antenna location will be located no closer to the card edge at any point than 1.5 mm. The PICC antenna must allow for a minimum restricted center area of; X=28mm, Y= 24mm for a total restricted area of no less than 672mmsq.

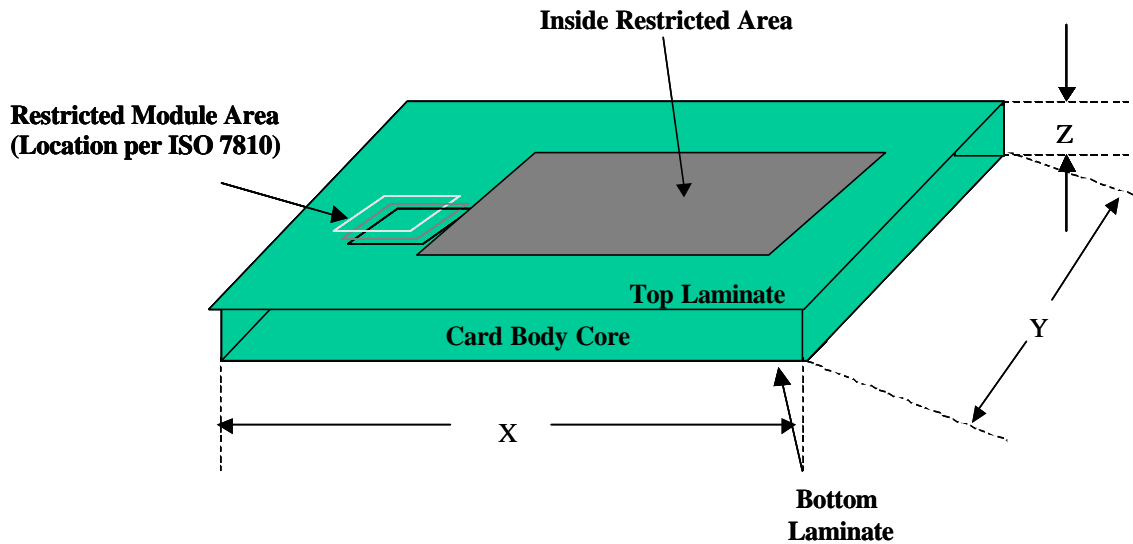


Figure 1c (LU\_ID-1M & LU\_TFC.1 card format)

#### 4.2.2 Limited Use Card Materials

Limited Use card materials shall be extended to include other than generically referred to plastics. The expected lifecycle of the PICC must be taken into account when the selection of card materials is being decided or selected. Post printing of the PICC shall be accommodated if required by the application usage excluding the PICCs Restricted Module Area as defined by the card manufacturer. (See Table 3 – Permitted materials)

Table 3--- Permitted Materials (um)

Type	Paper	Composite	Plastic
*LU_TFC.1 (Size)	270um +/- 16um	270um +/- 16um	270um +/- 16um
LU_ID-1M (Size)	400 um +/- 20um	400 um +/- 20um	400um +/- 20um

Note: Table entries refer to the nominal thickness of the material plus tolerance.

##### 4.2.2.1 Antenna Material

Materials used for the construction of the antenna must be consistent with the required electrical and physical stress specifications of this document; these materials in addition must meet the minimum matching electrical specification of the integrated circuit with an antenna that consumes the allocated ID-1 format area while preserving the restricted area. (See Annex C)

*NOTE: The Antenna distance read/write PICC and the PCD should be per the requirements set forth by the purchasing specification.*

**4.3 Additional Characteristics**

**4.3.1 Ultra-Violet light**

This part of the standard excludes requirements for protection of the PICC against the effects of the ultra-violet light levels greater than those in ordinary daylight at sea-level. Where greater protection is needed it shall be the responsibility of the card manufacturer to provide it and to state the tolerable level of ultra-violet light that includes the altitude of expected usage.

**4.3.2 X-rays**

The PICC shall continue to operate as intended after exposure of either face to medium X-radiation, with energy in the range of 70keV to 140keV, of a cumulative dose of 0,1 Gy per year.

**4.3.2.1 Irradiation**

The PICC shall continue to operate as intended after testing in accordance with the applicable test methods described in ISO/IEC 10373-6 when first exposed to an irradiation beam with one of the dosage exposures selected per Table 4.1.

Table 4.1 ---- Irradiation Dosage Classification

<b>Exposure class</b>	<b>Irradiated Dosage</b>	<b>Exposure(s)</b>	<b>PICC Packaging Visual Impact</b>
Class 1	56kGy	1.0	No visual packaging distortion or printing discoloration shall occur
Class 2	56kGy	2.0	No visual packaging distortion or printing discoloration shall occur

**4.3.3 Dynamic Bending Stress**

The PICC shall continue to operate as intended after testing in accordance with the applicable test methods described in ISO/IEC 10373-6 where the maximum deflections about the long card axe (X or h<sub>w</sub>A) and the short card axes (Y or h<sub>w</sub>B) are per the classifications in Table 4.2.

Table 4.2 ---- Bend Stress Classification

<b>Bend Class</b>	<b>Bend h, A=mm</b>	<b>Bend h, B =mm</b>	<b>PICC Packaging Visual Impact</b>
Class 1	Per ISO 14443-1 for standard ID-1 PICC	Per ISO 14443-1 for standard ID-1 PICC	No visual packaging distortion, delaminating or

Identification cards – Contactless Integrated Circuits(s) Proximity Card- Limited Use cards

			print cracking shall occur
Class 2	26	12	No visual packaging distortion, delaminating or print cracking shall occur

**4.3.4 Dynamic Torsional Stress**

The PICC shall continue to operate as intended after testing in accordance with the test methods described in ISO/IEC 10373 where the maximum angle of rotation is extended to a Angle= 20°.

**4.3.5 Alternating Magnetic Fields**

The PICC shall continue to operate as intended after exposure, in any orientation, to a magnetic field with an average level of 0.163 A/m rms @ a frequency of 30-300 mhz. The average time is one-minute and the maximum rms level of the magnetic field is limited to 33 times the average level. *(This specification may be omitted if the purchasing contract removes this requirement)*

**4.3.6 Alternating Electric Fields**

The PICC shall continue to operate as intended after exposure, in any orientation, to an electric field with an average level of 0.3 to 3.0 MHz at average electric field strength of 614 V/m rms. The average time is one-minute and the maximum rms level of the electric field is limited to 33 times the average level. *(This specification may be omitted if the purchasing contract removes this requirement)*

**4.3.7 Static Electricity**

The PICC shall continue to operate as intended after testing in accordance with the test methods described in ISO/IEC 10373 (referring to IEC 61000 4-4-2:1995), where the test voltage is 6.0KV. An optional provision for and extended voltage of up to 10.0KV is allowed if required by the application use.

**4.3.8 Static Magnetic Field**

The PICC shall continue to operate as intended after exposure to a static 640 kA/m magnetic field.

**4.3.9 Operating Temperatures and Packaging**

Note: Under different conditions, certain characteristics will change significantly, including dimensions (width (X), height (Y), thickness (Z), weight, flatness and many of the physical parameters listed in Table 5. At the extremes of the operating environment these changes can be substantial, and should be taken into account in the design of the both the LU\_ID-1M and LU\_TFC.1 handling devices. (Table 2 and 3 of ISO/IEC 15457-1 sections 4.72 and 4.73 are aligned with Tables-4 and 5 below where applicable.)

**4.3.9.1 Storage Environment and Packaging**

The PICC shall maintain physical appearance as intended if stored in a non-operative manner over ambient temperatures per Table 4.

**Table 5 ---- Storage Conditions**

Card type	Temperature °C	Relative humidity %
LU_TFC.1	0 to 60	30 to 65 non-condensing
LU_ID-1M	0 to 60	30 to 85 non-condensing

**4.3.9.2 Operating Environment and Packaging**

The PICC shall maintain physical appearance and functionality described in ISO/IEC 10373-6 in an operative manner over ambient temperatures per Table 6.

**Table-6 --- Operating conditions**

Card type	Temperature °C	Relative humidity %
LU_TFC.1	-20 to 60	15 to 95 non-condensing
LU_ID-1M	-20 to 60	15 to 95 non-condensing

In some applications, the temperature range can be limited by the cold crack temperature (See ISO/IEC 15457 Annex C for applicability)

**4.3.9.3 Outline Geometry**

Table 7 shows, for each card type (format), the values of the outline geometry.

**Table 7 ---- Quantity values for outline geometry (mm)**

Card type	Quantity symbol	LU_TFC.1	LU_ID-1M
Width	X	85.72mm Maximum 85.47mm Minimum	85.72mm Maximum 85.47mm Minimum
Height	Y	54.03mm Maximum 53.92mm Minimum	54.03mm Maximum 53.92mm Minimum
Thickness	Z	See Table 1	See Table 1
Edge Straightness	N/A	+/- 0.05mm	+/- 0.05mm

## Identification cards – Contactless Integrated Circuits(s) Proximity Card- Limited Use cards

Flatness	N/A	<2.1mm	<2.1mm
Transverse curl	N/A	<1.1mm	<1.1mm
Twist	N/A	<1.1mm	<1.1mm
Coefficient of friction Paper/Stainless steel (machine and cross directions) ISO 15457-3	N/A	0.23 +/- 0.05	0.23 +/- 0.05

**4.3.9.4 Reel Dimensions**

Reference ISO/IEC 15457-1 sections 6.2, 6.2.1 and 6.2.2. Substitute related dimensions in section 6.2 Table 5 reference with dimensions in Table 7 above.

**4.3.9.5 Fan Fold Pack**

Reference ISO 15457-1 sections 6.3, 6.3.1 and 6.3.1.1 substituting the (a) and (b) dimensions in Figure-9 (Perforated line card using beveled card as an example) with Table-7 above were  $x=b$  and  $y=a$ . Substituting section 6.3.1.1 Figure 10 (Bridge joined card using beveled card as an example) dimensions  $f=y$  and  $g=x$  and all other dimensions per Figure 10.

**4.3.9.6 Quality of Limited Use cards**

(See ISO/IEC 15457 section 4.4)

**4.3.10 Operating Limited Use Lifecycle**

The LU PICC shall operate as intended after testing in accordance with the applicable test methods described in ISO/IEC 10373-6 for a lifecycle period per Table 8.

**Table 8 – Operational Limited Use Lifecycle categories**

Category type	Lifecycle period days (min-max.)	Environment
A	5-10	Less than 95% humidity
B	5-35	Less than 95% humidity
C	5-180	Less than 95% humidity

*Note: Where type “A” could be paper and type “C” could be plastic or a composite material. Further, The PICC lifecycle values for card “Category type” (A, B and C), in Table 5 are determined by an expected “Average Use Factor” (AUF) of 4.5 uses or transactions per day over a period of “Lifecycle period days”. These uses are defined as a complete transaction containing either reads and or writes of the PICC data or any modification thereof. A user presents the PICC to the PCD active field and allows it to remain in the field until the transaction has completed. The duration of user handling of the card (Card remains in users hand) is 15 minutes between transactions with an ambient environment per Table 5.*

#### **4.3.11 Limited Use Embossing**

There shall be no provision for embossing of a Limited Use PICC with the exception of Brail for the blind but, shall be restricted to the “restricted area” of the LU PICC card body as defined in section 4.2.1 of this document.

#### **4.3.12 Limited Use Data User Memory**

The Limited Use PICC memory should be no greater than 1K byte of usable space. However, a greater memory size is permitted if the application requires. In either case the integrated circuit total area must not exceed 0.5mmsq.

*Note: Memory limitation is applied to maintain the intended purpose and reasonable application of the product to remain as a low cost, limited use application and limited lifecycle product for a special class of PICC.*

### **Informative(s)**

#### **Annex A**

##### **Standards Compatibility**

This part of the Proposed ANSI standard does not preclude the addition of other existing card standards on the PICC, such as those listed as follows:

ISO/IEC 7811, Identification cards - Recording technique

ISO/IEC 15693, Identification cards- Contactless integrated circuits(s) cards – Vicinity cards

ISO/IEC 7813, Identification cards – Financial transactions cards

#### **Annex B**

##### **Surface Quality for Printing**

Where there is a requirement to customize the PICC after the manufacturing process by over printing, care should be taken to ensure the areas used for printing are of sufficient quality appropriate to the printing technique or printer used.

Where there is a requirement to customize the PICC to accommodate post-printing of textual or graphical information, care should be taken to allow the thermal printing onto the card surface during the actual user’s transactions.

The print contrast signal of a machine readable printed mark is defined as:

$$PCS = \frac{R_w - R_p}{R_w}$$

*Note: Also reference ISO/IEC 15457-1 section 3.5.*

## Annex C

### Material Reference

Suggested Limited Use Antenna materials:

Silver, Aluminum, Aluminum-alloy, conductive composites and Copper-alloy

Suggested Card Body Surface Materials:

Triplex: Poly/Paper/Poly

Paper with Poly protective coating

Poly on Poly

Paper

Notes:

- *Poly could be either PVC or PET material composition*
- *Paper must be 100% chemical pulp, containing no ground wood*
- *This reference is provided as a non-exhausted guide for materials that should be considered in the construction of Limited Use PICCs.*