

Identification cards – Limited Use (LU), Proximity Integrated Circuit Card (PICC)

1.0 Scope

A physical specification with similar electronic characteristics of a Proximity Integrated Circuit Cards (PICCs) such as those specified within 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 for thin flexible cards. Construction attributes, pertaining to the materials, functionality and environmental requirements and targeted use are also specified. This type of PICC is to be classified as a Limited Use – Proximity Integrated Circuit Card (LU-PICC).

1.1 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-PICCs 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. Further, this LU-PICC specification is not intended for applications where card life cycle requirements are significant (*greater than 6 months or where extensive and high security applications are required or intended*). This class of PICC may be applied to Private and Public Transit Systems requiring electronic ticketing, building security access systems as well as many other applications in North America such as retail that are not provided for through the international standards forum.

2.0 Normative References

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

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

ISO/IEC 15457 –1, 2 and 3, (Thin flexible cards)

ISO/IEC 7810, (ID1 Smart Cards, Physical)

3.0 Terms and Definitions

3.1 Back face

The face of the card body that is opposite to the designated front of the card.

3.2 Card body

The finished ID-1 modified packaging of the LU-PICC with or without printing applied.

3.3 Finished card

The card at the point of issue to the public or user

3.4 Front face

Reference or designated face of the card which, normally bears printed information (text and graphics) relating to its origin and ownership.

3.5 Height (Y)

Dimension parallel to the shortest edge of the card, referenced as the Y dimension.

3.6 Integrated circuit (IC):

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

3.7 Limited Use-Proximity Coupling Device (LU-PCD)

A reader/writer device using inductive coupling to provide power to the PICC. As well as the control of data exchange with the LU-PICC.

3.8 Limited Use-Proximity Integrated Circuit Card (LU-PICC Card):

A type of proximity integrated circuit card that conforms to the requirements of low cost applications by limiting; functionality, construction complexity, lifecycle and security while maintaining core interoperability with other standardized PICCs. LU-PICCs contain only the necessary user data memory required to support a single application or a small set of applications. The data user memory size should be no greater than 1K byte of usable space. Since, LU-PICCs are specified to operate with reduced security and other integrated circuit and packaging limitations; this memory size limitation is suggested to reduce improper applied use.

The physical aspects of the LU-PICC is a card of type ID-1 (as specified in ISO/IEC 7810), with the ID-1 thickness and construction materials modified. Therefore, the LU-PICC “X” and “Y” dimensions of the LU-PICC are identical to type ID-1. The LU-PICC contains an integrated circuit(s) with a Radio Frequency (RF) coupling means which, communications to such integrated circuit(s) by inductive coupling in proximity of a coupling device. The card body dimensions of thickness and material construction are per section four (4.0) of this document.

3.9 Print contrast signal (PCS)

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

R_p is the reflectance of the printed mark, measured in accordance with ISO 1831 for the B 900 spectral band, R_w is the reflectance of the background surrounding the printed mark, measured in accordance with ISO 1831 for the B 900 spectral band

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

3.10 Recording technique

Technique, such as electronic, magnetic or optical encoding etc., used to store data on the card

3.11 Reference edge

Datum edges for dimensioning and orientation, having a fixed relationship to the front of the card

3.12 Regular card

Card without thermal sensitive coating

3.13 Tactile identifier

A feature used to determine the orientation of the card, only applied if a magnetic strip is integrated onto the card.

3.14 Thermal card

Card with thermal sensitive coating used to provide post printing

3.15 Width (X)

Dimension parallel to the longest edge of the card, referenced as the X dimension.

3.16 Wood free

Card body packaging (of paper) 100 % chemical pulp, containing no ground wood

3.17 Twist

Off-axis curl resulting in the four corners of the card not being co-planar

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 not limited to only 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 as restated in Table 7. In addition, the thickness shall adopt the ISO/IEC 15457-1 & 3 Thin Flexible Card specifications where applicable but with modified thickness specification that classifies two distinct types (See Figures 1a & 1b also see Table 6)."

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 1a.

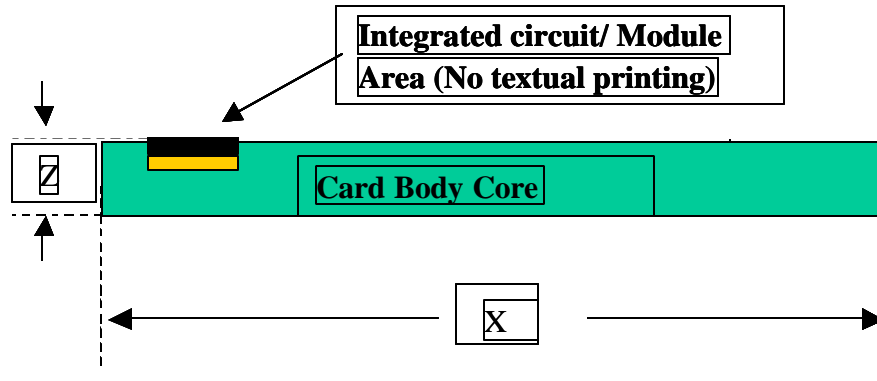


Figure 1a (LU ID-1M & LU_TFC.1 card format)

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. (See Figure 1b).

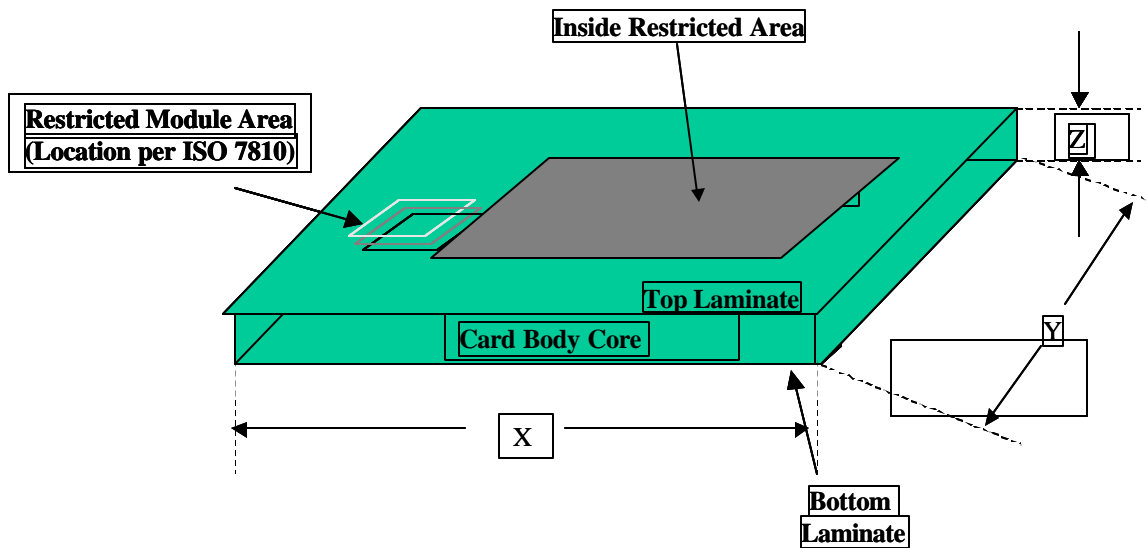


Figure 1b (LU_ID-1M & LU_TFC.1 card format)

4.2.2 Limited Use Card Materials

Limited Use card materials are not limited to only materials 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.

Note: Materials recommended for LU-PICCs of various thicknesses are defined in Annexes C as an informative. (Also see ISO/IEC 15457 Table 1 as Referenced TFCs).

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

Exposure class	Irradiated Dosage	Exposure(s)	PICC Packaging Visual Impact
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 axis (X or h_wA) and the short card axes (Y or h_wB) are per the classifications in Table 4.2.

Table 4.2 ---- Bend Stress Classification

Bend Class	Bend h, A=mm	Bend h, B =mm	PICC Packaging Visual Impact
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 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 an 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.

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.

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 4-2:1995), where the test voltage is 10.0KV.

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, the values of the outline geometry.

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

Card type	Dimension 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
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 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 which shall be located entirely within the “restricted area” of the LU PICC card body as defined in section 4.2.1 of this document.

4.3.12 Magnetic stripe

A magnetic strip may be added to the card body, the magnetic strip and track characteristics are specified in ISO/IEC 15457-2.

4.3.13 Limited Use PICC Integrated Circuit (Die) size

The integrated circuit used to manufacture a LU-PICC shall not exceed 1.0mmsq in total die area. Such die area restrictions are applied to prevent premature failure of the LU-PICC since reduced die size is a significant contributor to durability and lifecycle despite the manufacturing technique.

Note: In the case where a technology other than the traditional silicon die is applied, the size of the logic circuit may be extended beyond this die area limitation and intrude in the restricted area. Caution must be taken to ensure that such non-traditional silicon die circuits can be applied in a manner that ensures the same lifecycle requirements specified by the end user. All other specification in this standard must be adhered too.

4.3.14 Quality of LU-PICC products

All cards, however presented, shall be generally free from minor defects which could interfere with the performance of LU-PICCs or which detract from their visual appearance, such as joints, excessive dust, cutting debris, folds, tears, creases and thick spots.

Stiffness (for a 400um Thick Material)

Using the Taber method, the stiffness shall conform to the following value:

- The Taber test will be performed using the Taber V-5 model 150-B test machine measured with a 15° angle and standard non-weighted pendulum.
- The test sample will be cut to the specimen size of 1½ inch x 2¾ inch, using the triple cut specimen shear.
- When measured parallel to the grain, a specimen cut from a credit card size ticket will be between 30 and 50 gm/cm Taber stiffness units.

4.3.15 Toxicity

Individual LU-PICC shall not cause injury by contact, inhalation, or ingestion in normal use. Bulk media shall be handled and stored in accordance with the toxicological information contained in the product safety data sheets supplied by the LU-PICC supplier.

4.3.16 Flexing Endurance

Wrapping the LU-PICC completely around a ¾ inch diameter cylinder, and then removing it, will not produce a visible crease or wrinkle in the LU-PICC stock or cause any damage to the surface or functionality of the LU-PICC. This test must be performed on each face surface of the ticket, using a new ticket for each test.

Note: So the tester does not try to perform the test perpendicular to the ticket edge.

4.3.17 Adhesion (*Not Applicable to Roll Stock*)

Ten pre-cut LU-PICC complete with graphics and serial numbers, shall not adhere to each other when stacked on a flat surface for 24 hours at 144°F (62°C) and 90% to 95% (non-condensing) RH with an applied normal pressure on the LUCSC of 1 lb/in² (70.5 g/cm²).

Note: It may be necessary to apply anti-static coatings to the LU-PICC in order to meet this requirement.

4.3.18 Coefficient of Friction (*Not Applicable to Roll Stock*)

The LU-PICC shall be measured for friction in accordance with ASTM D1894-95. The LU-PICC shall be measured in the direction of the long axis and oriented in the same way, such that edges are coincident. The measured value for the inter-LUCSC static coefficient of friction shall fall within the specified range of 0.12 to 0.28.

4.3.19 Reference edges

Any specification for a LU-PICC card conforming to this standard shall nominate a reference face (the front) and two reference edges, having the relationship such that all features of the finished card can be located within the same frame of reference. Once identified, these same reference edges shall be used exclusively and consistently when locating all features as specified in the applicable parts of ISO/IEC 15457.

4.3.20 Finished Edges

Each card edge and corner bevel (as applicable to the card body format) shall be straight to within the value given as applicable to ISO/IEC 15457-1. The same exception applies in the case of a rounded corner, within a corner arc.

Any mismatch (barb) between a rounded corner and either of its adjacent sides shall be limited to the value of maximum displacement given in Table 4 of ISO/IEC 15457-1 of the side from the parallel tangent on the corner arc. Discontinuities in any rounded corner (cut-ins, fiber clusters, and single fibers) shall be limited to the value of maximum deviation given in Table 4 from a smooth corner arc of the same radius.

Note: Figure-4 below is extracted from ISO/IEC 15457 for reader convenience.

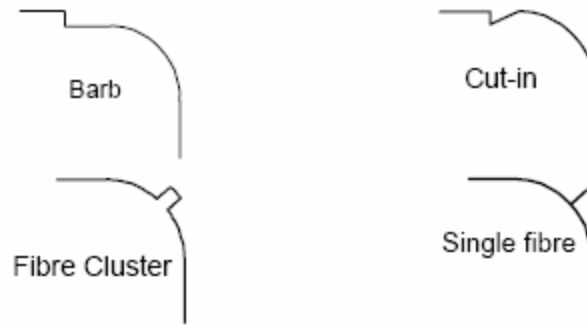


Figure 4 — Edge defects illustrated on rounded corner example

NOTE: For safety reasons, neither plastic nor composite cards should be cut with rectangular corners.

4.3.21 Finishing

LU-PICCs are finished in a variety of ways, in accordance with the requirements of the system in which they are to be used. They may be:

- printed or pre-printed except in areas used by recording techniques and machine functions (e.g. magnetic stripes, positioning marks, where used);
- equipped for one or more recording techniques (e.g. magnetic stripes, optical bar codes).

(Also see ISO/IEC 15457)

5.0 Roll/Reel and Fan-Fold

All clauses in all parts of ISO/IEC 15457 apply to finished cards or to the Roll/Reels or Fan-Fold packs from which such cards are taken. Certain clauses however concern the characteristics of the card throughout its life. As a matter of convenience and practicality, certain tests can be carried out on unfinished cards where it can be demonstrated that no significant change in that characteristic can arise during subsequent processing.

5.1 Roll/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.

5.1.1 Roll/Reel Feed (*Attachment of Last LU-PICC to Cardboard Spool*)

The last LU-PICC on the roll that contacts the cardboard spool must be complete and not partial and must not have any rips, cuts or tears.

The LU-PICC material must freely separate from the cardboard spool. There must not be any glue, adhesive tape or staples remaining on the LUCSC stock or on any of the LU-PICC material that was removed. The LU-PICC material may be retained onto the spool by using double adhesive tape. This tape will have two adhesive strengths: between the spool and the tape, the adhesion will be high; between the tape and the LU-PICC stock, the adhesion will be low. This difference in adhesion will allow the LU-PICC stock to easily peel away from the spool, leaving both the tape and its adhesives remaining on the spool.

5.1.2 Tightness of Wind Test

The roll of LU-PICCs must be wound tightly enough to prevent the spool from telescoping out during normal use.

For conformance to this requirement, the roll must pass the following test:

1. Use a complete flat roll of stock (1,000 LU-PICC) with its retaining elastic band in place. (The roll may be flattened by tapping it on a flat surface prior to starting the test.)
2. Place two bars 0.25-inch x 0.25-inch x 6-inches (6.35 x 6.35 x 152.4 mm) on a flat surface.
3. Align the bars to be parallel with a 6-inch (127 mm) space between them.
4. Place the roll on top of the bars so that it overlaps on each side by an equal amount.
5. Carefully apply a 4.4 lb (2 kg) weight to the cardboard spool.
6. Leave for one hour at 60 ± 5 degrees F (15.5 degrees C) and $50\% \pm 10\%$ RH.
7. After one hour, a 0.125-inch (3.175 mm) thick gauge resting on the flat surface should slide under the roll without touching it.

5.2 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 are per Figure 10.

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 LU-PICC, such as those listed as follows:

- ISO/IEC 7810; Smart Cards-Physical Specifications
- ISO/IEC 7811; Identification cards - Recording technique
- ISO/IEC 15457; Thin Flexible cards – Physical specifications
- 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 should 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.*