INTERNATIONAL STANDARD

ISO/IEC 21481

Second edition
2012-07-01

Information technology — Telecommunications and information exchange between systems — Near Field Communication Interface and Protocol -2 (NFCIP-2)

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Interface et protocole -2 en communication de champ proche (NFCIP-2)

Reference number
ISO/IEC 21481:2012(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 21481 was prepared by Ecma International (as ECMA-352) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This second edition cancels and replaces the first edition (ISO/IEC 21481:2005), which has been technically revised.

Introduction

In 2002, Ecma International formed Task Group 19 of Technical Committee 32 to specify Near Field Communication (NFC) signal interfaces and protocols. The NFC devices are wireless closely coupled devices communicating at 13,56 MHz.

Although ISO/IEC 18092 (NFCIP-1), ISO/IEC 14443 and ISO/IEC 15693 all specify 13,56 MHz as their working frequency, they specify distinct communication modes. These are defined as NFC, PCD, and VCD communication modes, respectively.

This International Standard (NFCIP-2) specifies the mechanism to detect and select one communication mode out of those three possible communication modes. Furthermore, NFCIP-2 requires that subsequent behaviour be as specified in the standard specifying the selected communication mode.

In 2009, JTC 1/SC 6 and JTC 1/SC 17 studied together for improving interoperability between ISO/IEC 21481 and ISO/IEC 14443. This second edition of ISO/IEC 21481 is revised based on the study, and the PICC mode is added to the existing three modes.

Information technology — Telecommunications and information exchange between systems — Near Field Communication Interface and Protocol -2 (NFCIP-2)

1 Scope

ISO/IEC 18092, ISO/IEC 14443 and ISO/IEC 15693 specify the radio frequency signal interface, initialization, anti-collision and protocols for wireless interconnection of closely coupled devices and access to contactless integrated circuit cards operating at 13,56 MHz.

This International Standard specifies the communication mode selection mechanism, designed not to disturb any ongoing communication at 13,56 MHz, for devices implementing ISO/IEC 18092, ISO/IEC 14443 or ISO/IEC 15693. This International Standard requires implementations to enter the selected communication mode as specified in the respective International Standard. The communication mode specifications, however, are outside the scope of this International Standard.

2 Conformance

Conforming devices implement mode selection specified in Clause 7 and implement the NFC MODE, PCD MODE, VCD MODE, and PICC MODE.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 18092:2004, *Information technology — Telecommunications and information exchange between systems — Near Field Communication — Interface and Protocol (NFCIP-1)*

ISO/IEC 14443-2:2010, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-3:2011, *Identification cards — Contactless integrated circuits cards — Proximity cards — Part 3: Initialization and anticollision*

ISO/IEC 14443-4:2008, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol*

ISO/IEC 15693-2:2006, *Identification cards — Contactless integrated circuit cards — Vicinity cards — Part 2: Air interface and initialization*

ISO/IEC 15693-3:2009, *Identification cards — Contactless integrated circuit cards — Vicinity cards —Part 3: Anticollision and transmission protocol*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
***H*THRESHOLD**
minimum value of an external RF field

NOTE Adapted from ISO/IEC 18092:2004, 4.6.

4.2
NFCIP-2 device
ISO/IEC 21841 entity

4.3
NFC MODE
mode in which an NFCIP-2 device operates as specified in ISO/IEC 18092

4.4
fc
frequency of operating field (carrier frequency) as specified in ISO/IEC 14443-2

4.5
PICC MODE
mode in which an NFCIP-2 device operates as a Type A or Type B Proximity Integrated Circuit Card or Object as specified in ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4

4.6
PCD MODE
mode in which an NFCIP-2 device operates as a Proximity Coupling Device as specified in ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4

4.7
VCD MODE
mode in which an NFCIP-2 device operates as a Vicinity Coupling Device as specified in ISO/IEC 15693-2 and ISO/IEC 15693-3

5 Conventions and notations

5.1 Names

The names of basic elements, e.g. specific fields, are written with a capital initial letter.

6 External RF field detection

During external RF field detection, NFCIP-2 devices shall, for a period of $T_{IDT} + n \times T_{RFW}$ (see 11.1.1 of ISO/IEC 18092:2004), detect external RF fields at *fc* with a value higher than $H_{THRESHOLD}$ and shall not switch on their own RF field.

7 Mode selection and switching

Mode switching specifies the procedure for NFCIP-2 devices to enter the NFC MODE, or the PCD MODE or PICC MODE or VCD MODE selected prior to the following sequence.

NFCIP-2 devices shall execute the following sequence:

1. The NFCIP-2 device shall have its RF field switched off.

2. If the PICC MODE has been selected, the NFCIP-2 device shall enter the PICC MODE.

3. If the NFCIP-2 device detects an external RF field, as specified in Clause 6, it shall enter the NFC MODE as a Target.

4. If the NFCIP-2 device does not detect an external RF field and the NFC MODE has been selected, it shall enter the NFC MODE as an Initiator.

5. If the NFCIP-2 device does not detect an external RF field and the PCD MODE or the VCD MODE has been selected, it shall perform external RF field detection and Initial RF generation as specified in Clause 8.

Figure 1 illustrates the above procedure.

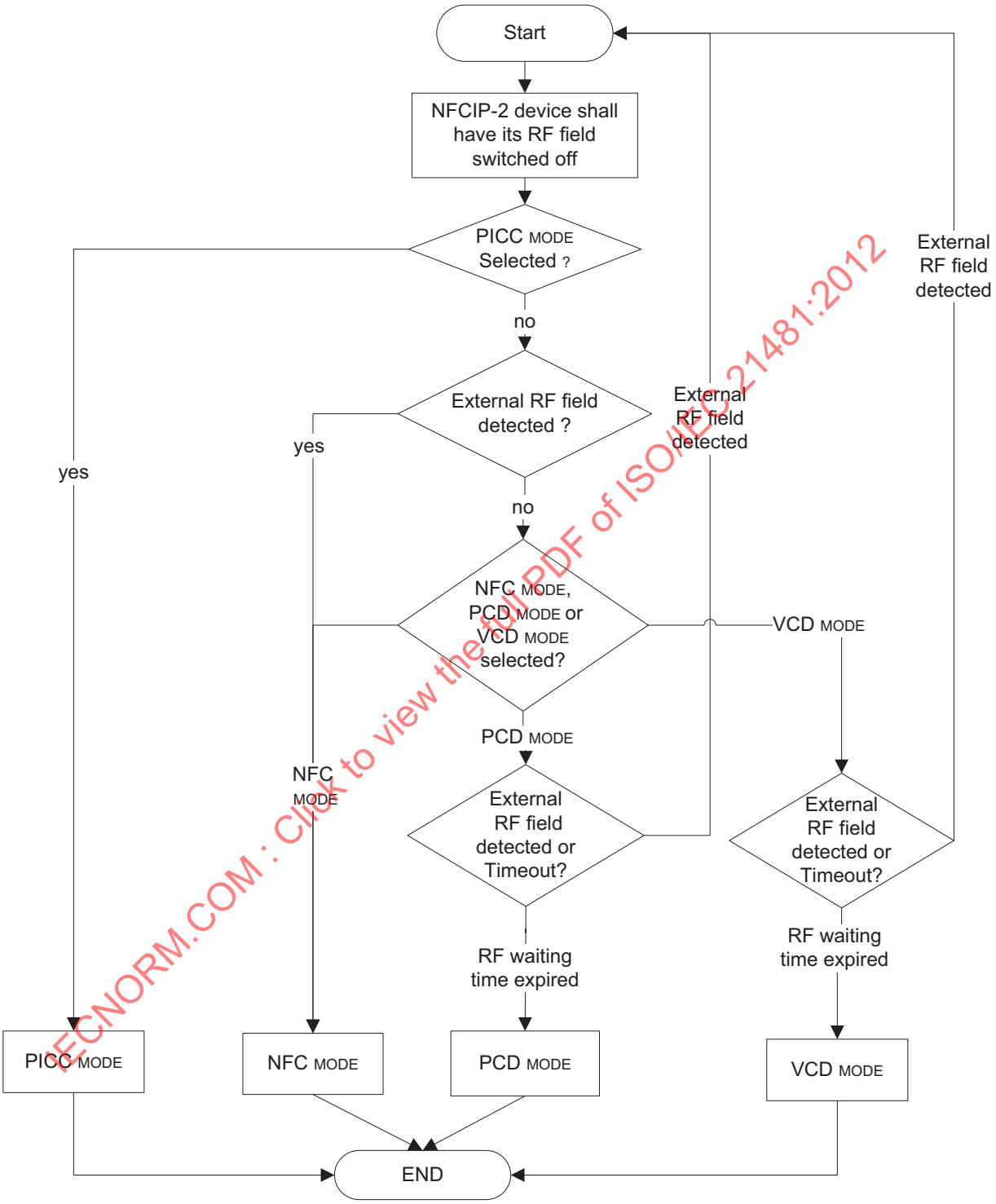

Figure 1 — Mode selection

8 External RF field detection and initial RF generation

When the NFCIP-2 device detects an external RF field, as specified in Clause 6, during the time $T_{IDT} + n \times T_{RFW}$ it shall recommence the procedure specified in Clause 7.

If the NFCIP-2 device does not detect an external RF field during the time $T_{IDT} + n \times T_{RFW}$, it shall switch on its RF field, and enter the selected communication mode while observing T_{IRFG}. See 11.1.1 of ISO/IEC 18092:2004 for TIDT, TRFW and *n*. T_{IRFG} is the initial guard-time between switching on RF field and starting modulation to send command or data. 5.1 of ISO/IEC 14443-3:2011 and 7.3 of ISO/IEC 15693-2:2006 specify T_{IRFG} for PCD MODE and VCD MODE, respectively.

Figure 2 illustrates the external RF field detection and initial RF generation.

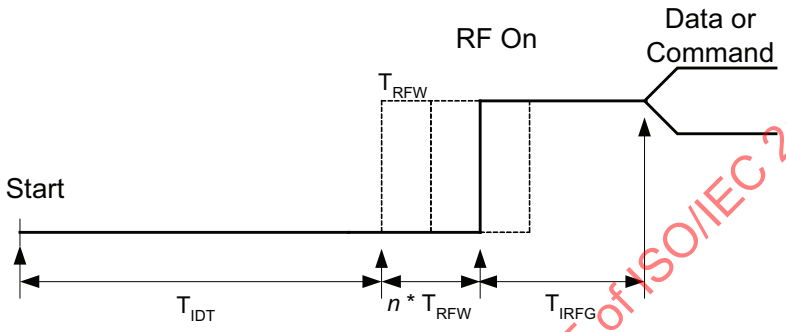

Figure 2 — RF detection and initial RF generation for PCD MODE and VCD MODE