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# Near Field Communication interface and protocol -2 (NFCIP-2)

Standard

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# 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 ECMA-340, ISO/IEC 14443 and ISO/IEC 15693 standards 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 document (NFCIP-2) specifies the mechanism to detect an external RF field and select one communication mode out of those four possible communication modes. Furthermore, NFCIP-2 requires that subsequent behaviour be as specified in the standard specifying the selected communication mode.

The 2nd edition added support for the PICC mode from ISO/IEC 14443.

In 2018, the work to revise this document started with the improvement of mode selection and switching to address the latest use cases. Furthermore, harmonization with the NFC Forum requirement specification is intended.

This 4th edition is aligned with ISO/IEC 21481:2021.

This Ecma Standard was developed by Technical Committee 51 and was adopted by the General Assembly of December 2021.

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# Near Field Communication Interface and Protocol -2 (NFCIP-2)

## 1 Scope

This document specifies the communication mode selection and switching mechanism, designed not to disturb any ongoing communication at 13,56 MHz, for devices implementing ISO/IEC 18092, the ISO/IEC 14443 or ISO/IEC 15693 series. The communication modes are specified in the respective International Standards and are outside of the scope of this document.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 14443-2, *Cards and security devices for personal identification — Contactless proximity objects — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-3, *Cards and security devices for personal identification — Contactless proximity objects — Part 3: Initialization and anticollision*

ISO/IEC 14443-4, *Cards and security devices for personal identification — Contactless proximity objects — Part 4: Transmission protocol*

ISO/IEC 15693-2, *Cards and security devices for personal identification — Contactless vicinity objects — Part 2: Air interface and initialization*

ISO/IEC 15693-3, *Cards and security devices for personal identification — Contactless vicinity objects — Part 3: Anticollision and transmission protocol*

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

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

**3.1**
***fc***
**carrier frequency**
frequency of operating field

NOTE 1 to entry: fc shall be 13,56 MHz ± 7 kHz as specified in ISO/IEC 14443-2, ISO/IEC 15693-2 and ISO/IEC 18092.

NOTE 2 to entry: 13,56 MHz ± 7 kHz is a frequency band allocated in Reference [2] for ISM applications.

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**3.2**
***H*THRESHOLD**
threshold value to detect an external RF field

[SOURCE: ISO/IEC 18092:2013, 4.6.]

**3.3**
**NFC mode**
mode in which an NFCIP-2 device operates as an NFCIP-1 device

NOTE 1 to entry: NFC mode shall be compliant with the mandatory NFCIP-1 device requirements of ISO/IEC 18092.

**3.4**
**PCD mode**
mode in which an NFCIP-2 device operates as a PCD

NOTE 1 to entry: PCD mode shall be compliant with the mandatory PCD requirements of ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4.

**3.5**
**PICC mode**
mode in which an NFCIP-2 device operates as a PICC

NOTE 1 to entry: PICC mode shall be compliant with the mandatory PICC requirements of ISO/IEC 14443-2, ISO/IEC 14443-3 and ISO/IEC 14443-4.

**3.6**
**VCD mode**
mode in which an NFCIP-2 device operates as a VCD

NOTE 1 to entry: VCD mode shall be compliant with the mandatory VCD requirements of ISO/IEC 15693-2 and ISO/IEC 15693-3.

## 4 Abbreviated terms

| | |
|---|---|
| ISM | industrial, scientific and medical |
| NFC | near field communication |
| PCD | proximity coupling device |
| PICC | proximity integrated circuit card |
| RF | radio frequency |
| VCD | vicinity coupling device |

## 5 Conventions and notations

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

## 6 NFCIP-2 device

A conforming NFCIP-2 device shall implement the external RF field detection specified in Clause 7, the RF field generation specified in Clause 8, and the mode selection and switching specified in Clause 9.

The NFCIP-2 device shall implement NFC mode, PICC mode, PCD mode and VCD mode.


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## 7 External RF field detection

During external RF field detection, an NFCIP-2 device shall, for a period of $T_{IDT} + n \times T_{RFW}$, detect external RF fields at *fc* with a value higher than $H_{THRESHOLD}$ and shall not generate an RF field. $T_{IDT}$, $T_{RFW}$, *n* and $H_{THRESHOLD}$ are specified in ISO/IEC 18092.

## 8 RF field generation

The NFCIP-2 device may only generate its RF field if it does not detect an external RF field as specified in Clause 7.

Figure 1 illustrates the RF field generation including the external RF field detection.

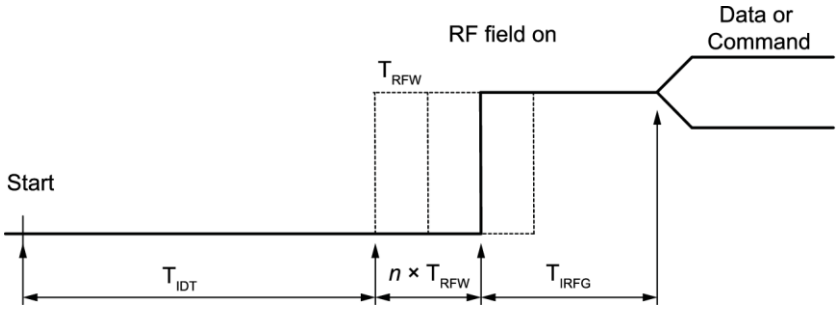


**Figure 1 — External RF field detection and RF field generation**

## 9 Mode selection and switching

This clause specifies the procedure, which is comprised of mode selection and the sequence for mode switching, for NFCIP-2 devices to switch to the NFC mode, the PCD mode, the PICC mode or the VCD mode.

Initially the NFCIP-2 device shall not generate its RF field prior to the procedure.

The mode is selected prior to the execution of the following sequence.

When repeating the procedure, the NFCIP-2 device may stop generating its RF field to change the communication modes.

The NFCIP-2 device shall execute the following sequence:

a) If the PICC mode has been selected, the NFCIP-2 device shall not generate its RF field and shall switch to the PICC mode.

b) If the NFC mode has been selected, the NFCIP-2 device shall switch to the NFC mode.

c) If the PCD mode has been selected, and if the NFCIP-2 device

   1) generates its RF field, it shall switch to the PCD mode;

   2) does not generate its RF field, it shall perform external RF field detection as specified in Clause 7. If no external RF field is detected, the NFCIP-2 device shall generate an RF field as specified in Clause 8 and switch to the PCD mode. Otherwise, the NFCIP-2 device shall recommence the procedure.

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d) If the VCD mode has been selected, and if the NFCIP-2 device

1) generates its RF field, it shall switch to the VCD mode;

2) does not generate its RF field, it shall perform external RF field detection as specified in Clause 7. If no external RF field is detected, the NFCIP-2 device shall generate an RF field as specified in Clause 8 and switch to the VCD mode. Otherwise, the NFCIP-2 device shall recommence the procedure.

Figure 2 illustrates the procedure.

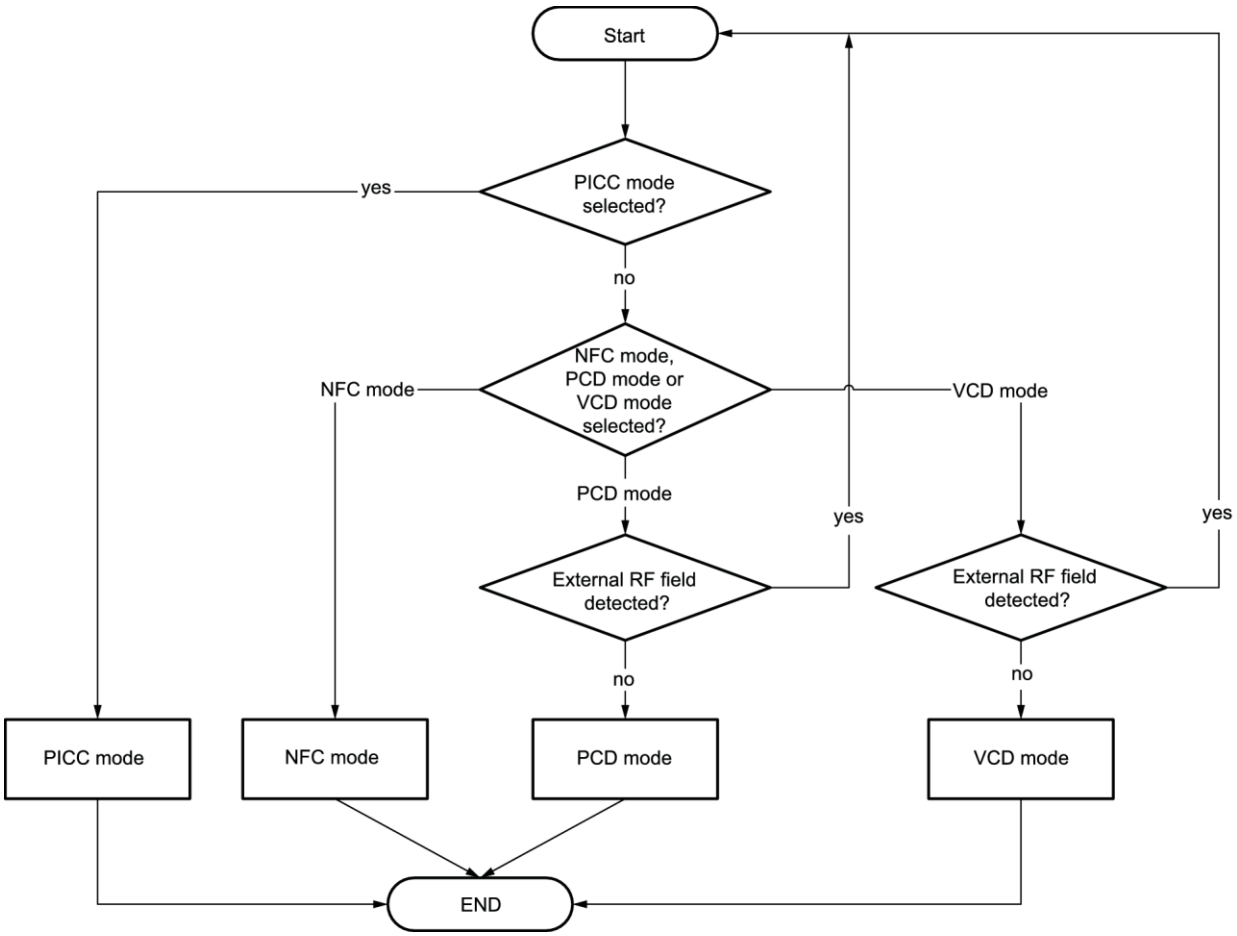


**Figure 2 — Mode selection and switching**

NOTE Use case examples of the NFCIP-2 device are described in Reference [1].


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# Bibliography

[1] NFC Forum, Devices Requirements, v2.0 or later, available at https://nfc-forum.org.

[2] ITU-R Radio Regulations Article 5, 2012.

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