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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 ISO/IEC 18092, 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, PICC, and VCD communication modes respectively.

This NFCIP-2 Standard specifies the mechanism to detect 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 adds support for the PICC mode from ISO/IEC 14443.

This Ecma Standard has been adopted by the General Assembly of June 2010.

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

1 Scope

ECMA-340, ISO/IEC 14443 and ISO/IEC 15693 standards specify the RF signal interface, initialisation, anti-collision and protocols for wireless interconnection of closely coupled devices and access to contactless integrated circuit cards operating at 13,56 MHz.

This Standard specifies the communication mode selection mechanism, designed to not disturb any ongoing communication at 13,56 MHz, for devices implementing ECMA-340, ISO/IEC 14443 or ISO/IEC 15693. This Standard requires implementations to enter the selected communication mode as specified in the respective standard. The communication mode specifications, however, are outside the scope of this NFCIP-2 Standard.

2 Conformance

A conforming implementation complies with all the mandatory clauses in this Standard.

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.

ECMA-340, *Near Field Communication - Interface and Protocol (NFCIP-1)*

ISO/IEC 14443, *Identification cards -- Contactless integrated circuit cards – Proximity cards*

ISO/IEC 15693, *Identification cards -- Contactless integrated circuit cards -- Vicinity cards*

4 Terms and definitions

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

4.1
$H_{Threshold}$
the minimum value of an external RF field that a NFCIP-2 device shall detect to not disturb ongoing communication by ensuring that its own RF field is switched off.

4.2
NFC MODE
mode in which NFCIP-2 device operates as specified in ECMA-340.

4.3
fc
carrier frequency [ISO/IEC 18092] – frequency [ISO/IEC 14443-2, ISO/IEC 15693]

4.4
PICC
Proximity Integrated Circuit Card or Object as specified in ISO/IEC 14443.

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4.5
PICC MODE
mode in which NFCIP-2 device operates as PICC as specified in ISO/IEC 14443.

4.6
PCD
Proximity Coupling Device as specified in ISO/IEC 14443.

4.7
PCD MODE
mode in which NFCIP-2 device operates as PCD as specified in ISO/IEC 14443.

4.8
VCD
Vicinity Coupling Device as specified in ISO/IEC15693.

4.9
VCD MODE
mode in which NFCIP-2 device operates as VCD as specified in ISO/IEC 15693.

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 threshold value

NFCIP-2 devices shall detect external RF fields at f*c* with a value higher than $H_{THRESHOLD}$ while performing external RF field detection.

The value of $H_{THRESHOLD}$ = 0,1875 A/m.

7 RF Field detection

In order to not disturb any communication on f*c*, an NFCIP-2 device shall not switch on its RF field when it detects an external RF field, as specified in Clause 6.

8 Mode selection

Mode selection specifies the procedure for NFCIP-2 devices to select and subsequently enter one of the NFC MODE, or the PCD MODE or PICC MODE or VCD MODE.

NFCIP-2 devices shall implement the following functions:

1. Initiator and target as specified in ECMA-340;
2. PCD as specified in ISO/IEC 14443;
3. VCD as specified in ISO/IEC 15693; and

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4. PICC as specified in ISO/IEC 14443.

NFCIP-2 devices shall execute the following sequence:

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

2. If the NFCIP-2 device detects an external RF field, as specified in Clause 6, it shall select either the PICC MODE or the NFC MODE.

3. If the NFCIP-2 device does not detect an external RF field it shall select the NFC MODE, or the PCD MODE or the VCD MODE

4. If the NFCIP-2 device has selected the NFC MODE, it shall enter the NFC MODE.

5. NFCIP-2 devices that have selected either the PCD MODE or VCD MODE, shall perform RF detection, Initial RF generation and subsequently enter the selected mode as specified in Clause 9.

Figure 1 illustrates the above procedure.

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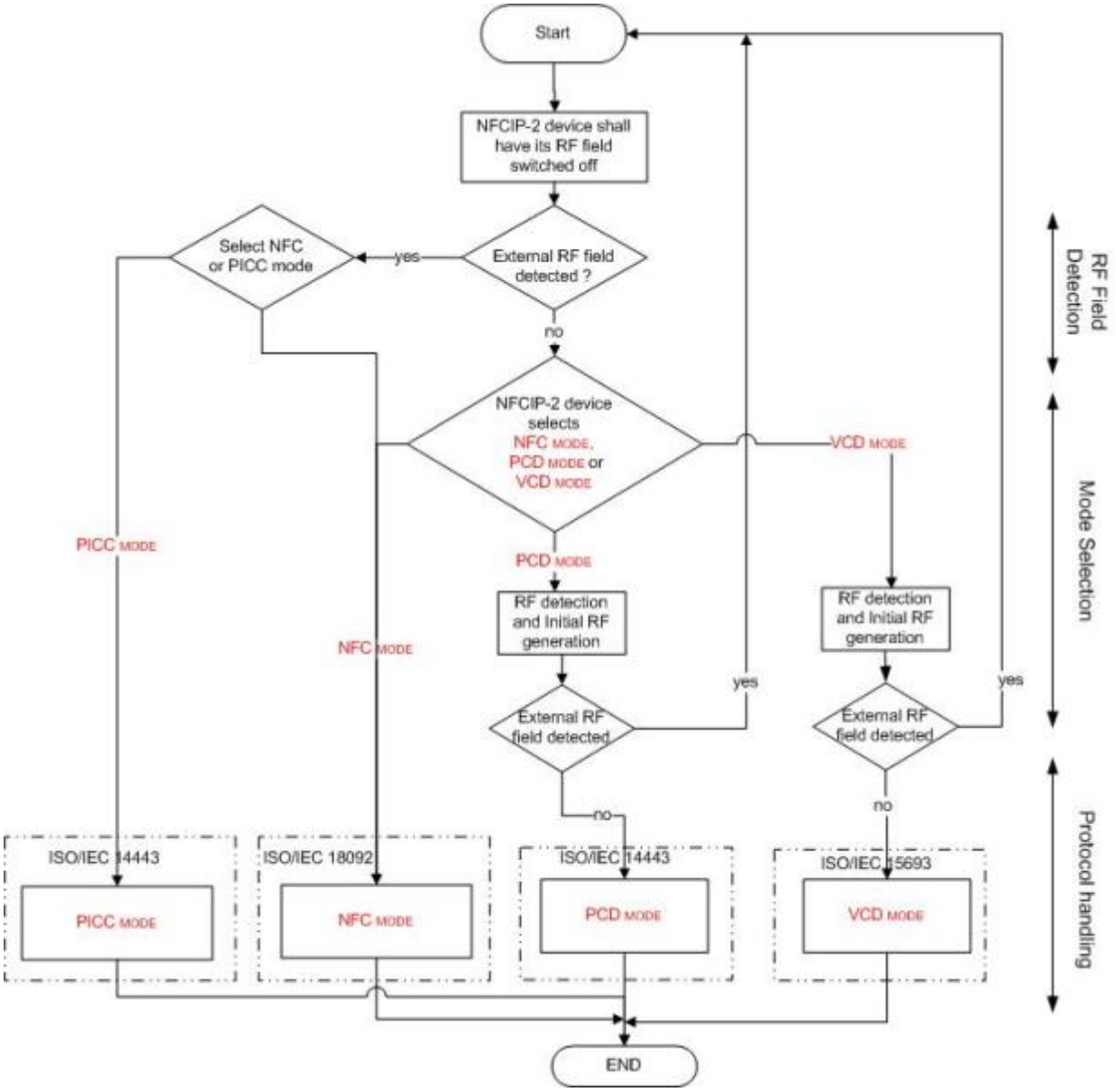

Figure 1 – Mode selection

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9 RF detection and Initial RF generation

Any NFCIP-2 device having selected the PCD MODE or the VCD MODE shall continue the mode selection sequence and comply with the timing as specified below.

When the NFCIP-2 device detects an external RF field, as specified in Clause 7, during the time $T_{IDT} + n \times T_{RFW}$ it shall recommence the mode selection procedure that is specified in Clause 8.

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.

Figure 2 illustrates the RF detection and initial RF generation.

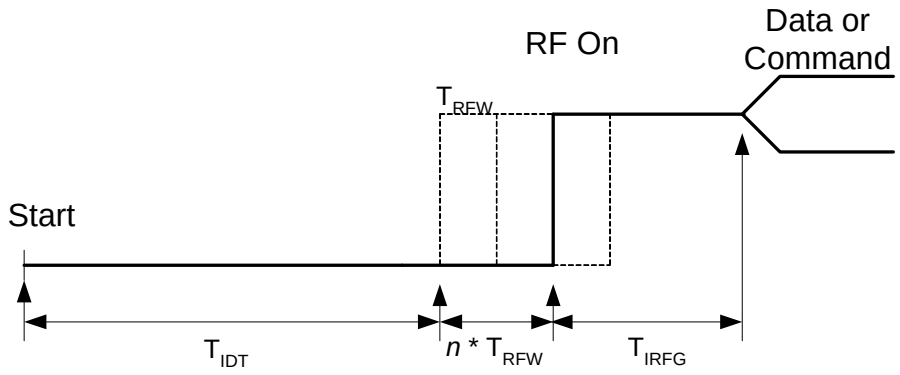

Figure 2 – RF detection and initial RF generation for *PCD MODE* and *VCD MODE*

T_{IDT}: Initial delay time. $T_{IDT} > 4\,096 / fc$ (~300 µs)

T_{RFW}: RF waiting time. $512 / fc$ (~38 µs)

n: randomly generated integer $0 \leq n \leq 3$

T_{IRFG}: Initial guard-time between switching on RF field and start modulation to send command or data. The specification of T_{IRFG} is not part of this Standard.
In PCD MODE the time between switching on the RF field and modulating the field to transmit data is specified in Clause 5 of ISO/IEC 14443-2.
In VCD MODE the time between switching on the RF field and modulating the field to transmit data is specified in Clause 7.3 of ISO/IEC 15693-2.

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