BSI TR-03150 Part 2

Plan for Testing of Contactless Readers for Conformance with CEN/TS 16794:2017
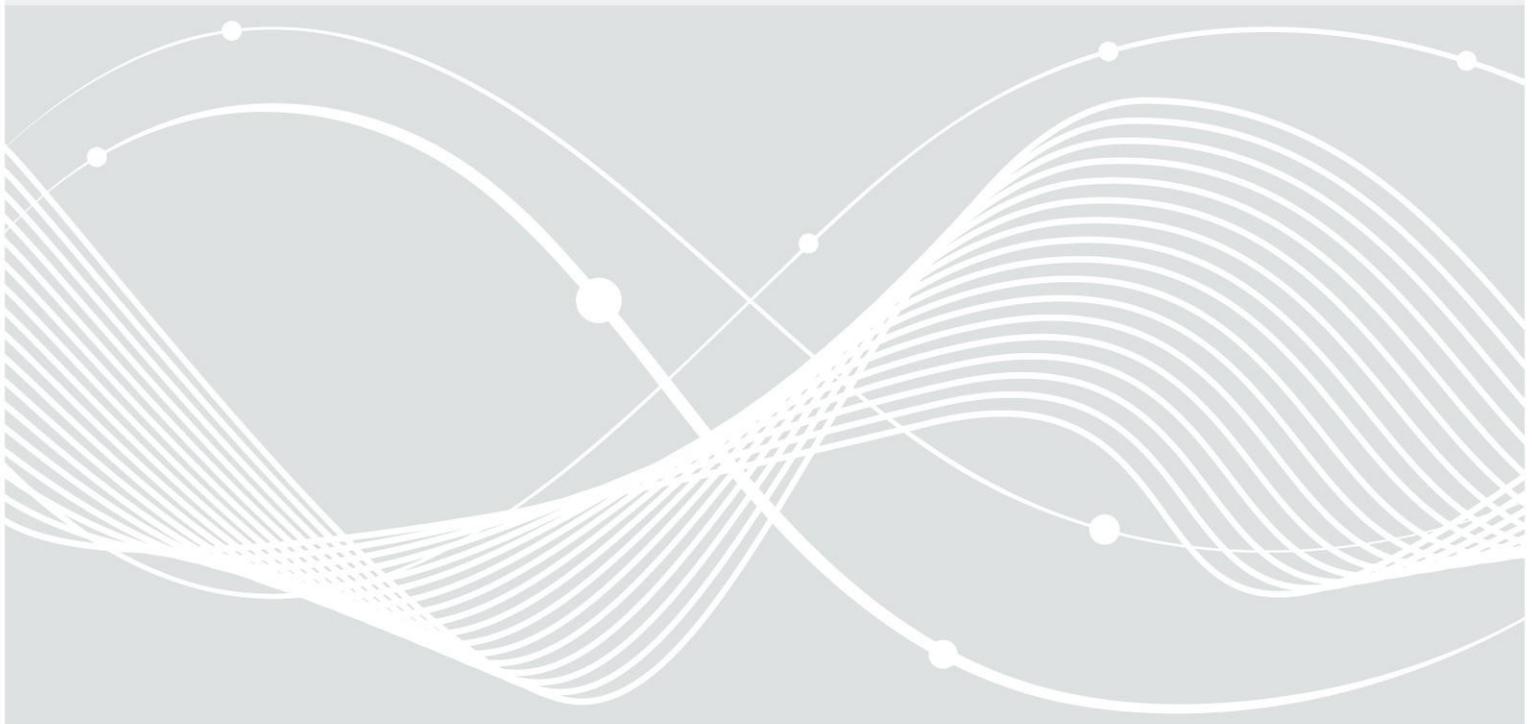
Document history

Version	Date	Editor	Description
1.0	2018-02-27	BSI	Initial release of Edition 1
1.1	2020-03-24	BSI	Annex B (Interoperability with EMVCo Contactless) added, Annex A (ICS) extended

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1 Introduction

The Federal Office for Information Security recognizes the importance of mobile services for the modern society and is engaged in activities that target open ecosystems for the mobile services which provide open, non-discriminatory access for technology and service providers and support appropriate levels for IT security and privacy for mobile service customers.

Technical interoperability between all devices that participate in an infrastructure for mobile services is a mandatory prerequisite for the market introduction of an open ecosystem. All relevant functions and interfaces have to be specified by open specifications and respective certification schemes have to be in place. The Federal Office for Information Security took an active role in international standards and industry bodies that develop and harmonize open standards and specifications which support technical interoperability and security for mobile devices and the application and market-specific infrastructures for mobile services like eID, eGovernment and mobility.

As member of NFC Forum and GSMA, the Federal Office for Information Security participated in a dedicated effort to establish interoperability between NFC mobile devices on one side and media and readers of existing card-based infrastructures on the other side. Public Transport served as an example for other market sectors that use ISO/IEC 14443 as standard for the contactless interface. The NFC Forum updated its analog specification for the NFC-interface of mobile devices in order to support technical interoperability with ISO/IEC 14443-based media and readers and also took public transport specific requirements as given by CEN/TS 16794 into account. CEN TC278 WG3 SG5 supported the synchronization with NFC Forum's Analog Specification in a joint working group.

CEN/TS 16794:2017 is the first specification for contactless readers and media which was formally synchronized with NFC Forum's Analog 2.0 specification for mobile devices. It will ensure technical interoperability between conformant media and readers in the Transport sector and also with NFC mobile devices which conform to NFC Forum's Analog 2.0 specification.

The Federal Office for Information Security will support the introduction of the open ecosystem for mobile services by offering the TR-03150 certification program to the market. The program shall ensure conformity with CEN/TS 16794:2017 and shall not only support Public transport media or readers but potentially also other market sectors with similar requirements like eID, access control , employee ID etc.

2 General Test Requirements

2.1 Validity of Referenced Documents

In order to prevent potential conflicts caused by updates of any of the referenced documents (see Annex), no modifications or extensions of these documents occurring after October 01, 2017 are taken into account. This especially holds for (yet unpublished) amendments to specifications which would have automatically become applicable right after publication otherwise.

2.2 Test Setup and Equipment

The test environment shall be set up as defined in CEN/TS 16794-2:2017, Clause 5.

2.3 Test Conditions

The test conditions defined in CEN/TS 16794-1:2017, Clause 9.2, shall be applied. It is recommended to use the loopback interface as defined in CEN/TS 16794-1:2017, Annex B.

2.4 Report

The test report shall include the templates defined in CEN/TS 16794-2:2017, Annex A (tables A.1, A.2, A.3). The decision on the final test report format (which may contain more information than those presented in the reference tables) is made by the test laboratory (in coordination with the BSI).

3 Analog Tests

The Analog tests for PCD shall be performed with respect to the general test conditions defined in CEN/TS 16794-2:2017, Clause 6.1.

3.1 PCD Maximum Field Strength

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.2.2 ("TC_PCD_A_MaxFS").
It shall be performed as described there, without modifications.

3.2 PCD Minimum Field Strength

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.2.3 ("TC_PCD_A_MinFS").
It shall be performed as described there, without modifications.

3.3 Alternating Magnetic Field

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.2.4 ("TC_PCD_A_ALF").
It shall be performed as described there, without modifications.

Please note: There is a second definition of this test scenario (see CEN/TS 16794-2:2017, Clause 6.6). As both definitions are identical, it is sufficient to perform an arbitrary one of them.

3.4 Type A Modulation Waveform

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.3.1 ("TC_PCD_A_TAMW").
It shall be performed as described there, without modifications.

3.5 Type B Modulation Waveform

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.3.2 ("TC_PCD_A_TBMW").
It shall be performed as described there, without modifications.

3.6 Type A Load Modulation Reception

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.4.1 ("TC_PCD_A_TALMR").
It shall be performed as described there, without modifications.

3.7 Type B Load Modulation Reception

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.4.2 ("TC_PCD_A_TBLMR").

It shall be performed as described there, without modifications.

3.8   Type A EMD Immunity

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.5.2 ("TC_PCD_A_TAEI").
It shall be performed as described there, without modifications.

3.9   Type B EMD Immunity

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.5.3 ("TC_PCD_A_TBEI").
It shall be performed as described there, without modifications.

3.10   Type A EMD Handling Timing Constraints

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.5.4 ("TC_PCD_A_TAER").
It shall be performed as described there, without modifications.

3.11   Type B EMD Handling Timing Constraints

This test scenario is defined in CEN/TS 16794-2:2017, Clause 6.5.5 ("TC_PCD_B_TAER").
It shall be performed as described there, without modifications.

4 Digital Tests

The Digital tests for PCD shall be performed with respect to the general test conditions defined in CEN/TS 16794-2:2017, Clause 8.1.

4.1 PCD Digital Conformance to ISO/IEC 14443 Standard Series

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.2.
It shall be performed as described there, without modifications.

4.2 PCD Type A Detection Time

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.1 ("TC_PCD_D_TADT").
It shall be performed as described there, without modifications.

4.3 PCD Type B Detection Time

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.2 ("TC_PCD_D_TBDT").
It shall be performed as described there, without modifications.

4.4 AFI Value sent by the PCD

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.3 ("TC_PCD_D_AFI").
It shall be performed as described there, without modifications.

4.5 PCD Extended ATQB Option

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.4 ("TC_PCD_D_ATQB").
It shall be performed as described there, without modifications.

4.6 Recommendations on RFU Bits and Values Reception Test

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.5 ("TC_PCD_D_RFU").
It shall be performed as described there, without modifications.

4.7 Proprietary Protocols Management by the PCD

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.6 ("TC_PCD_D_PRO").
It shall be performed as described there, without modifications.

4.8   ATQA sent after Modulated Field

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.7 ("TC_PCD_D_TAMF").
It shall be performed as described there, without modifications.

4.9   ATQB sent after Modulated Field

This test scenario is defined in CEN/TS 16794-2:2017, Clause 8.3.8 ("TC_PCD_D_TBMF").
It shall be performed as described there, without modifications.

Annex A   Implementation Conformance Statement

In order to ensure a proper test setup, it is mandatory for an applicant to provide a completed ICS (Implementation Conformance Statement) document.

All items defined in CEN/TS 16794-1:2017, Clause 9.1.2, shall be included in the ICS. In addition, the following item shall also be included:

- Reader device is also compliant to EMVCo Contactless specification: Yes/No

If "Yes" is selected, Annex B of this document shall be regarded. Otherwise, it shall be ignored.

The final definition of actual design and content of the ICS form is the task of the test laboratory (in coordination with the BSI).

In addition to the specification of the technical characteristics of the DUT, the ICS document shall contain the following information:

- Applicant's company name and address
- Contact partner (including name, phone number, and email address)

It has to be ensured that the completed ICS (at least the technical parts) is provided to the test lab prior to the test start.

Annex B   Interoperability with EMVCo Contactless

Some contactless reader devices are not only used for public transport applications but additionally for processing payments (e.g., if a charge-up of a fare media is payed with a credit card, using the same terminal). These readers do not only have to be compliant to CEN/TS 16794 but also to EMVCo Contactless. As there are a few contradictions in-between both specifications (anticollsion handling, usage of S(DESELECT)), it is not possible to pass both certification testing sessions without some adaptations.

Due to this reason, the following test scenarios (all contained in group 4.1, "PCD Digital Conformance to ISO/IEC 14443 Standard Series") shall be declared as "not applicable" if a given reader device additionally claims compliance to EMVCo Contactless:

- ISO/IEC 10373-6:2016, H.2.3 Handling of bit collision during ATQA
- ISO/IEC 10373-6:2016, H.2.4 Handling of anticollision loop, Procedure 4 (scenario H.4)
- ISO/IEC 10373-6:2016, H.2.5 Handling of RATS, Procedure 1 (scenario H.5)
- ISO/IEC 10373-6:2016, H.4.3 Error detection and recovery, Procedure 4 (scenario H.21)
- ISO/IEC 10373-6:2016, H.4.3 Error detection and recovery, Procedure 12 (scenario H.29)

All other test scenarios (from all groups) shall be applied without modification.

Reference Documentation

[1]   *CEN*
         CEN/TS 16794-1:2017
         Public transport – Communication between contactless readers and fare media –
         Part 1: Implementation requirements for ISO/IEC 14443
         Second edition, 2017-07

[2]   *CEN*
         CEN/TS 16794-2:2017
         Public transport – Communication between contactless readers and fare media –
         Part 2: Test plan for ISO/IEC 14443
         Second edition, 2017-07

[3]   *ISO/IEC*
         ISO/IEC 14443-1:2016
         Identification cards – Contactless integrated circuit cards – Proximity cards –
         Part 1: Physical characteristics
         Third edition, 2016-03-15

[4]   *ISO/IEC*
         ISO/IEC 14443-2:2016
         Identification cards – Contactless integrated circuit cards – Proximity cards –
         Part 2: Radio frequency power and signal interface
         Third edition, 2016-07-15

[5]   *ISO/IEC*
         ISO/IEC 14443-3:2016
         Identification cards – Contactless integrated circuit cards – Proximity cards –
         Part 3: Initialization and anticollision
         Third edition, 2016-06-01

[6]   *ISO/IEC*
         ISO/IEC 14443-4:2016
         Identification cards – Contactless integrated circuit cards – Proximity cards –
         Part 4: Transmission protocol
         Third edition, 2016-06-01

[7]   *ISO/IEC*
         ISO/IEC 10373-6:2016
         Identification cards – Test methods –
         Part 6: Proximity cards
         Third edition, 2016-07-15

Keywords and Abbreviations

ATQA	Answer to request, type A
ATQB	Answer to request, type B
ATS	Answer To Select
CID	Card Identifier
DUT	Device Under Test
EGT	Extra Guard Time
EMD	Electromagnetic disturbance
EOF	End Of Frame
etu	Elementary time unit
fc	Carrier frequency (13.56 MHz)
FDT	Frame delay time
fs	Subcarrier frequency (847.5 kHz)
H_{max}	Maximum operating field strength
H_{min}	Minimum operating field strength
ICS	Implementation Conformance Statement
m	Modulation index
NAD	Node address
PCD	Proximity Coupling Device
PICC	Proximity Integrated Circuit Card
PPS	Protocol and Parameter Selection
PT	Public Transport
RATS	Request for Answer To Select
REQA	Request command, type A
REQB	Request command, type B
RF	Radio frequency
RT	Room temperature
SOF	Start Of Frame
t_r, t_f	Rise time, fall time
TR0	Guard time between the end of a PCD transmission and the start of the SCIC subcarrier generation
TR1	Synchronization time between the start of the SCIC subcarrier generation and the start of the SCIC subcarrier modulation
TR2	Synchronization time between the start of the SCIC's EOF and the start of the PCD's next SOF