Certification Report

JCOP 4.5 P71

Sponsor and developer:	***NXP Semiconductors Germany GmbH*** **Troplowitzstrasse 20,** **22529 Hamburg** **Germany**
Evaluation facility:	***SGS Brightsight B.V.*** **Brassersplein 2** **2612 CT Delft** **The Netherlands**
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Author(s):	**Denise Cater**
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Head Office:
Westervoortsedijk 73
NL-6827 AV Arnhem

P.O. Box 2220
NL-6802 CE Arnhem
The Netherlands

Location Leek:
Eiberkamp 10
NL-9351 VT Leek

P.O. Box 37
NL-9350 AA Leek
The Netherlands

info@nl.tuv.com
www.tuv.com/nl

Tel. +31 (0)88 888 7 888
Fax +31 (0)88 888 7 879

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VAT number: NL815820380B01
IBAN: NL61DEUT0265155096

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Foreword

The Netherlands Scheme for Certification in the Area of IT Security (NSCIB) provides a third-party evaluation and certification service for determining the trustworthiness of Information Technology (IT) security products. Under this NSCIB, TÜV Rheinland Nederland B.V. has the task of issuing certificates for IT security products, as well as for protection profiles and sites.

Part of the procedure is the technical examination (evaluation) of the product, protection profile or site according to the Common Criteria assessment guidelines published by the NSCIB. Evaluations are performed by an IT Security Evaluation Facility (ITSEF) under the oversight of the NSCIB Certification Body, which is operated by TÜV Rheinland Nederland B.V. in cooperation with the Ministry of the Interior and Kingdom Relations.

An ITSEF in the Netherlands is a commercial facility that has been licensed by TÜV Rheinland Nederland B.V. to perform Common Criteria evaluations; a significant requirement for such a licence is accreditation to the requirements of ISO Standard 17025 “General requirements for the accreditation of calibration and testing laboratories”.

By awarding a Common Criteria certificate, TÜV Rheinland Nederland B.V. asserts that the product or site complies with the security requirements specified in the associated (site) security target, or that the protection profile (PP) complies with the requirements for PP evaluation specified in the Common Criteria for Information Security Evaluation. A (site) security target is a requirements specification document that defines the scope of the evaluation activities.

The consumer should review the (site) security target or protection profile, in addition to this certification report, to gain an understanding of any assumptions made during the evaluation, the IT product's intended environment, its security requirements, and the level of confidence (i.e., the evaluation assurance level) that the product or site satisfies the security requirements stated in the (site) security target.

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Recognition of the Certificate

The presence of the Common Criteria Recognition Arrangement (CCRA) and the SOG-IS logos on the certificate indicates that this certificate is issued in accordance with the provisions of the CCRA and the SOG-IS Mutual Recognition Agreement (SOG-IS MRA) and will be recognised by the participating nations.

International recognition

The CCRA was signed by the Netherlands in May 2000 and provides mutual recognition of certificates based on the Common Criteria (CC). Since September 2014 the CCRA has been updated to provide mutual recognition of certificates based on cPPs (exact use) or STs with evaluation assurance components up to and including EAL2+ALC_FLR.

For details of the current list of signatory nations and approved certification schemes, see http://www.commoncriteriaportal.org.

European recognition

The SOG-IS MRA Version 3, effective since April 2010, provides mutual recognition in Europe of Common Criteria and ITSEC certificates at a basic evaluation level for all products. A higher recognition level for evaluation levels beyond EAL4 (respectively E3-basic) is provided for products related to specific technical domains. This agreement was signed initially by Finland, France, Germany, The Netherlands, Norway, Spain, Sweden and the United Kingdom. Italy joined the SOG-IS MRA in December 2010.

For details of the current list of signatory nations, approved certification schemes and the list of technical domains for which the higher recognition applies, see https://www.sogis.eu.

1 Executive Summary

This Certification Report states the outcome of the Common Criteria security evaluation of the JCOP 4.5 P71. The developer of the JCOP 4.5 P71 is NXP Semiconductors Germany GmbH located in Hamburg, Germany and they also act as the sponsor of the evaluation and certification. A Certification Report is intended to assist prospective consumers when judging the suitability of the IT security properties of the product for their particular requirements.

The TOE is a Java Card with a GP Framework, It is a composite product consisting of a certified Micro Controller and a software stack which is stored on the Micro Controller and which can be executed by the Micro Controller. The TOE uses one or more communication interfaces to communicate with its environment. The TOE includes the JCVM, JCRE, JCAPI and the GP Framework. Also included is optional functionality and the Secure Box mechanism. Secure Box Native Libraries provide native functions for untrusted third parties and are not part of the TOE.

The TOE has been evaluated by SGS Brightsight B.V. located in Delft, The Netherlands. The evaluation was completed on 02 August 2022 with the approval of the ETR. The certification procedure has been conducted in accordance with the provisions of the Netherlands Scheme for Certification in the Area of IT Security *[NSCIB]*.

The scope of the evaluation is defined by the security target *[ST]*, which identifies assumptions made during the evaluation, the intended environment for the JCOP 4.5 P71, the security requirements, and the level of confidence (evaluation assurance level) at which the product is intended to satisfy the security requirements. Consumers of the JCOP 4.5 P71 are advised to verify that their own environment is consistent with the security target, and to give due consideration to the comments, observations and recommendations in this certification report.

The results documented in the evaluation technical report *[ETR]* [1] for this product provide sufficient evidence that the TOE meets the EAL6 augmented (EAL6+) assurance requirements for the evaluated security functionality. This assurance level is augmented with ASE_TSS.2 (TOE Summary Specification with architectural design summary) and ALC_FLR.1 (Basic flaw remediation).

The evaluation was conducted using the Common Methodology for Information Technology Security Evaluation, Version 3.1 Revision 5 *[CEM]* for conformance to the Common Criteria for Information Technology Security Evaluation, Version 3.1 Revision 5 *[CC]* (Parts I, II and III).

TÜV Rheinland Nederland B.V., as the NSCIB Certification Body, declares that the evaluation meets all the conditions for international recognition of Common Criteria Certificates and that the product will be listed on the NSCIB Certified Products list. Note that the certification results apply only to the specific version of the product as evaluated.

[1] The Evaluation Technical Report contains information proprietary to the developer and/or the evaluator, and is not available for public review.

2 Certification Results

2.1 Identification of Target of Evaluation

The Target of Evaluation (TOE) for this evaluation is the JCOP 4.5 P71 from NXP Semiconductors Germany GmbH located in Hamburg, Germany.

The TOE is comprised of the following main components:

Delivery item type	**Identifier**	**Version**
Hardware	NXP Secure Smart Card Controller N7122 with IC Dedicated Software and Crypto Library (R1) Customer Option: NOS-ROM See [HW-CERT] for more details.	A1
	IC Dedicated Test Software – Test Software	11.6.5
	IC Dedicated Support Software - Boot Software - Firmware - Library Interface	 11.6.5 11.6.5 11.6.5
	IC Dedicated Support Software - Crypto Library	 1.1.2
	Library - Communication Library - CRC Library - Memory Library	 7.10.2 1.1.8 1.2.3.1
Software	JCOP 4.5 OS OS Updater Modules	JCOP 4.5 OS Platform ID = J3R6000373181200 ROM ID = B3375FE9B5508BC4 Patch ID = 0000000000000000 (svn = 226072)
	Variant 1	Platform Build ID = 6D20B6197D635E7C OS Core ID = 55606FD4BEECF3CD
	Variant 2	Platform Build ID = 5314F0A7BAE6B138 OS Core ID = 318CCEEB284A3AF9

To ensure secure usage a set of guidance documents is provided, together with the JCOP 4.5 P71. For details, see section 2.5 “Documentation” of this report.

For a detailed and precise description of the TOE lifecycle, see the *[ST]*, Chapter 1.3.3.

2.2 Security Policy

The following cryptographic algorithms are supported:

- Data Encryption Standard with 3 keys (3DES) for en-/decryption (CBC and ECB) and MAC generation and verification (Retail-MAC, CMAC and CBC-MAC).

- Advanced Encryption Standard (AES) for en-/decryption (CBC, ECB and counter mode) and MAC generation and verification (CMAC, CBC-MAC).
- Rivest Shamir Adleman asymmetric algorithm (RSA) and RSA CRT for en-/ decryption and signature generation and verification.
- Modular and ECC point arithmetic functions not provided by the standard Java Card API
- RSA and RSA Chinese Remainder Theorem (CRT) key generation.
- Elliptic Curve Cryptography (ECC) over GF(p) for signature generation and verification (ECDSA).
- ECC over GF(p) key generation.
- Random number generation according to class DRG.3 or DRG.4 of AIS 20 [AIS 20].
- Diffie-Hellman with ECDH and modular exponentiation.
- SHA-1, SHA-224, SHA-256, SHA-384, SHA-512 hash algorithm.

The following (**non-TSF**) cryptographic primitives are supported:

- KoreanSEED
- AES in Counter with CBC-MAC mode (AES CCM)
- Keyed-Hash Message Authentication Code (HMAC)
- HMAC-based Key Derivation Function (HKDF) [RFC-5869]
- Elliptic Curve Direct Anonymous Attestation (ECDAA) [TPM]
- ECC based on Edwards and Montgomery curves

2.3 Assumptions and Clarification of Scope

2.3.1 Assumptions

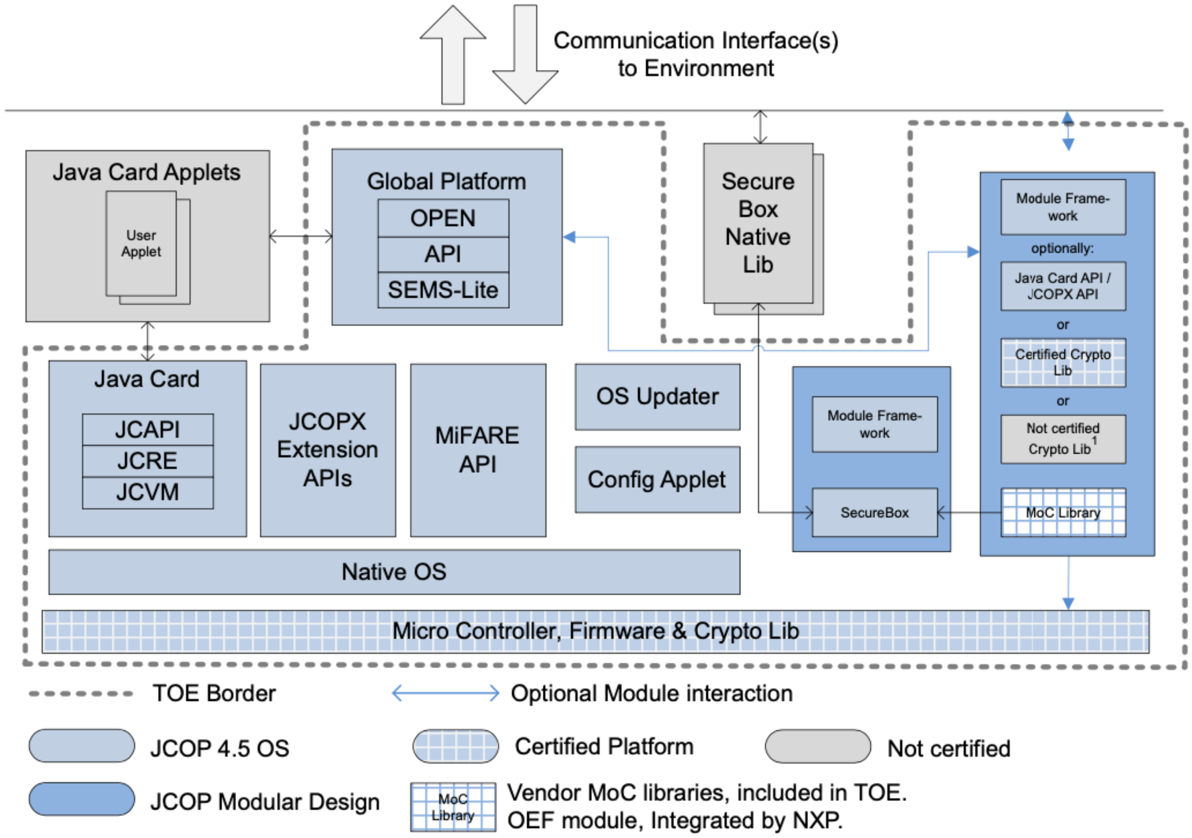
The assumptions defined in the Security Target are not covered by the TOE itself. These aspects lead to specific Security Objectives to be fulfilled by the TOE-Environment. For detailed information on the security objectives that must be fulfilled by the TOE environment, see section 5.2 of the *[ST]*.

2.3.2 Clarification of scope

The evaluation did not reveal any threats to the TOE that are not countered by the evaluated security functions of the product.

2.4 Architectural Information

The logical architecture, originating from the Security Target [ST] of the TOE can be depicted as follows:



The TOE has the following features:

Micro Controller component with IC Dedicated Software:

- Firmware for booting and low level functionality of the Micro Controller (MC FW) like writing to flash memory - This is included in the hardware Certification
- Software for implementing cryptographic operations, called Crypto Library - This is included in the hardware Certification

Security IC Embedded Software (JCOP OS):

- Software to update JCOP OS or UpdaterOS, called OS Update Component
- JCVM, JCRE, JCAPI 3.0.5 Classic for execution of Java Card applets according to [JCVM], [JCRE] and [JCAPI].
- GlobalPlatform (GP) Framework for lifecycle and card content management [GP] with GP AMD-H and AMD-I.
- Proprietary functionality
  - Extension API
  - Config Applet via the Configuration Module
  - API and functionality for MIFARE (not part of the TSF)
  - Software for executing native libraries called Secure Box
    - Provides the possibility for third party native libraries to be executed in a securely encapsulated environment.
    - Supports the installation of a choice of vendor specific Biometric libraries, for Match on Card, in production phase.
    - Supports installation of 3rd party native libraries post issuance.

The following communication protocols are supported:

- ISO 7816 T=0, T=1 [ISO7816]
- ISO 14443 T=CL [ISO14443]
- T1I2C – T1 over I2C [GP-SPI-I2C] and Global Platform APDU transport over SPI/I2C or NXP legacy UM 11225 [UM11225] according to Variant 1 configuration.

- I2C Master [UM10204]
- T1SPI – T1 over SPI and Global Platform APDU transport over SPI/I2C [GP-SPI-I2C].

2.5 Documentation

The following documentation is provided with the product by the developer to the customer:

Identifier	Version
[UG] JCOP 4.5 P71, User manual for JCOP 4.5 P71, User Guidance and Administrator Manual	Revision 1.5 25 May 2022

2.6 IT Product Testing

Testing (depth, coverage, functional tests, independent testing): The evaluators examined the developer's testing activities documentation and verified that the developer has met their testing responsibilities.

2.6.1 Testing approach and depth

The developer performed extensive testing on functional specification, subsystem and module level, covering all security functions and aspects of the TSF. The developer uses a set of industry standard and proprietary test suites and tools. The TOE is tested both in its physical implementation and using simulator and emulator platforms in order to cover all relevant aspects. During testing, the TOE is identified by its SVN number.

The developer uses a distributed and fully automated test environment to allow the execution of a vast amount of parallel tests. All results are logged and any unexpected results are flagged for analysis.

The overall completeness is being monitored using code coverage tools. For each tool, the developer has investigated and documented inherent limitations that can lead to coverage being reported as less than 100%. For all such cases, the developer provided a "gap" analysis with rationales.

The underlying hardware and crypto-library test results are extendable to composite evaluations, because the underlying platform is operated according to its guidance and the composite evaluation requirements are met.

The evaluators witnessed a selection of the developer tests covering various aspects of the TOE, as well as areas where the code coverage approach has limitations.

For the testing performed by the evaluators, the developer provided samples and a test environment. The evaluator independent testing was focused on verifying the TOE identification mechanisms to ensure that the preparative guidance procedures are sufficient, and on the adherence of the TOE implementation to the Java Card and GlobalPlatform specifications for selected corner cases.

2.6.2 Independent penetration testing

The independent vulnerability analysis was performed according to *[CC]* and *[JIL-AM]*. The ratings have been calculated according to *[JIL-AAPS]*. Overall, it was conducted along the following steps:

- When evaluating the evidence in classes ASE, ADV and AGD, the evaluator considered whether potential vulnerabilities could already be identified due to the TOE type and/or specified behaviour in such an early stage of the evaluation.
- For ADV_IMP a thorough implementation representation review was performed on the TOE. During this attack-oriented analysis, the protection of the TOE was analysed using the knowledge gained from all evaluation classes. This resulted in the identification of (additional) potential vulnerabilities. This analysis used the attack methods in [JIL-AM] and rating calculations in [JIL-AAPS].
- All potential vulnerabilities were analysed using the knowledge gained from all evaluation classes and information from the public domain. A judgment was made on how to assure that these potential vulnerabilities are not exploitable. The potential vulnerabilities were addressed by penetration testing, a guidance update or in other ways that were deemed appropriate.

The total test effort expended by the evaluators was 17 weeks. During that test campaign, 47% of the total time was spent on Perturbation attacks, 41% on side-channel testing, and 12% on logical tests.

2.6.3 Test configuration

The evaluator performed the testing on the TOE in the following configuration:

- Platform ID: J3R6000373181200
- TOE (CLCC68 package)
- IEC/ISO 7816 T=0/T=1

This is the same configuration as stated in *[ST]*. For this Variant 1 was used.

2.6.4 Test results

The testing activities, including configurations, procedures, test cases, expected results and observed results are summarised in the *[ETR]*, with references to the documents containing the full details.

The developer's tests and the independent functional tests produced the expected results, giving assurance that the TOE behaves as specified in its *[ST]* and functional specification.

No exploitable vulnerabilities were found with the independent penetration tests.

The strength of the implementation of the cryptographic functionality has been assessed in the evaluation, as part of the AVA_VAN activities. The algorithmic security level exceeds 100 bits for all evaluated cryptographic functionality as required for high attack potential (AVA_VAN.5).

For composite evaluations, please consult the *[ETRfC]* for details.

2.7 Reused Evaluation Results

There has been extensive reuse of the ALC aspects for the sites involved in the development and production of the TOE, by use of five Site Technical Audit Reports. In addition, sites involved in the development and production of the hardware platform were re-used by composition.

No sites have been visited as part of this evaluation.

2.8 Evaluated Configuration

The TOE is defined uniquely by its name and version number JCOP 4.5 P71.

The TOE can be identified by means of the IDENTIFY command as described *[ST]* section 1.3.4 and *[UG]* chapter 2. The IDENTIFY command also returns information about modules present in the TOE.

2.9 Evaluation Results

The evaluation lab documented their evaluation results in the *[ETR]*, which references an ASE Intermediate Report and other evaluator documents. To support composite evaluations according to *[COMP]* a derived document *[ETRfC]* was provided and approved. This document provides details of the TOE evaluation that must be considered when this TOE is used as platform in a composite evaluation.

The verdict of each claimed assurance requirement is "**Pass**".

Based on the above evaluation results the evaluation lab concluded the JCOP 4.5 P71, to be **CC Part 2 extended, CC Part 3 conformant**, and to meet the requirements of **EAL 6 augmented with ASE_TSS.2 and ALC_FLR.1**. This implies that the product satisfies the security requirements specified in Security Target *[ST]*.

The Security Target claims 'demonstrable' conformance to the Protection Profile *[PP_0099]*.

2.10 Comments/Recommendations

The user guidance as outlined in section 2.5 "Documentation" contains necessary information about the usage of the TOE. Certain aspects of the TOE's security functionality, in particular the countermeasures against attacks, depend on accurate conformance to the user guidance of both the software and the hardware part of the TOE. There are no particular obligations or recommendations for the user apart from following the user guidance. Please note that the documents contain relevant details concerning the resistance against certain attacks.

In addition, all aspects of assumptions, threats and policies as outlined in the Security Target not covered by the TOE itself must be fulfilled by the operational environment of the TOE.

The customer or user of the product shall consider the results of the certification within his system risk management process. For the evolution of attack methods and techniques to be covered, the customer should define the period of time until a re-assessment for the TOE is required and thus requested from the sponsor of the certificate.

The strength and use of the following cryptographic algorithms and protocols was not rated in the course of this evaluation because they are considered to be out of scope as there are no security claims:

- KoreanSEED
- AES in Counter with CBC-MAC mode (AES CCM)
- Keyed-Hash Message Authentication Code (HMAC)
- HMAC-based Key Derivation Function (HKDF) [RFC-5869]
- Elliptic Curve Direct Anonymous Attestation (ECDAA) [TPM]
- ECC based on Edwards and Montgomery curves

3 Security Target

The Security Target for JCOP 4.5 P71, Rev 1.4, 10 June 2022 *[ST]* is included here by reference.

Please note that, to satisfy the need for publication, a public version *[ST-lite]* has been created and verified according to *[ST-SAN]*.

4 Definitions

This list of acronyms and definitions contains elements that are not already defined by the CC or CEM:

AES	Advanced Encryption Standard
APDU	Application Protocol Data Unit
CBC	Cipher Block Chaining (a block cipher mode of operation)
CBC-MAC	Cipher Block Chaining Message Authentication Code
DAP	Data Authentication Pattern
DES	Data Encryption Standard
GP	Global Platform
ECB	Electronic Code Book (a block-cipher mode of operation)
ECC	Elliptic Curve Cryptography
ECDAA	Elliptic Curve Direct Anonymous Attestation
ECDH	Elliptic Curve Diffie-Hellman algorithm
ECDSA	Elliptic Curve Digital Signature Algorithm
HMAC	Keyed-Hash Message Authentication Code
HKDF	HMAC-based Key Derivation Function
I2C	Inter-Integrated Circuit
IC	Integrated Circuit
ISD	Issuer Security Domain
IT	Information Technology
ITSEF	IT Security Evaluation Facility
JCAPI	Java Card Application Programming Interface
JCRE	Java Card Runtime Environment
JCVM	Java Card Virtual Machine
JIL	Joint Interpretation Library
MC FW	Micro Controller Firmware
NSCIB	Netherlands Scheme for Certification in the area of IT Security
PP	Protection Profile
RSA	Rivest Shamir Adleman
SCP	Secure Channel Protocol
SSD	Supplementary Security Domain
TOE	Target of Evaluation

5 Bibliography

This section lists all referenced documentation used as source material in the compilation of this report.

[AIS20] AIS20/31: A proposal for: Functionality classes for random number generators, Version 2.1, 02 December 2011

[CC] Common Criteria for Information Technology Security Evaluation, Parts I, II and III, Version 3.1 Revision 5, April 2017

[CEM] Common Methodology for Information Technology Security Evaluation, Version 3.1 Revision 5, April 2017

[COMP] Joint Interpretation Library, Composite product evaluation for Smart Cards and similar devices, Version 1.5.1, May 2018

[ETR] Evaluation Technical Report “NXP JCOP 4.5 P71” – EAL6+, 22-RPT-717, v1.0, 2 August 2022

[ETRfC] Evaluation Technical Report for Composition “NXP JCOP 4.5 P71” – EAL6+, 22-RPT-150, v1.0, 2 August 2022

[GP] GlobalPlatform Card Specification 2.3.1, March 2018

[GP-SPI-I2C] GlobalPlatform Technology APDU Transport over SPI/I2C, Version 1.0, January 2020

[HW-CERT] Certification Report, NXP Secure Smart Card Controller N7122 with IC Dedicated Software and Crypto Library (R1) from NXP Semiconductors Germany GmbH, BSI-DSZ-CC-1149-2022

[HW-ETRfC] Evaluation Technical Report for Composite Evaluation (ETR COMP), NXP Secure Smart Card Controller N7122 with IC Dedicated Software and Crypto Library (R1) A1, version 3, 10 May 2022, TUV IT

[HW-STLite] Security Target Lite, NXP Secure Smart Card Controller N7122 with IC Dedicated Software and Crypto Library (R1), Rev. 1.3, 6 May 2022

[ISO7816] ISO 7816-3: Part 3: Cards with contacts - Electrical interface and transmission protocols, November 2006

[ISO14443] ISO/IEC 14443-4 Cards and security devices for personal identification - Contactless proximity objects - Part 4: Transmission protocol, July 2008

[JCAPI] Java Card 3 Platform, Application Programming Interface, Classic Edition, v3.0.5, May 2015

[JCRE] Java Card 3 Platform, Runtime Environment Specification, Classic Edition, v3.0.5, May 2015

[JCVM] Java Card 3 Platform, Virtual Machine Specification, Classic Edition, v3.0.5, May 2015

[JIL-AAPS] JIL Application of Attack Potential to Smartcards, Version 3.1, June 2020

[JIL-AM] Attack Methods for Smartcards and Similar Devices, Version 2.4, January 2020 (sensitive with controlled distribution)

[NSCIB] Netherlands Scheme for Certification in the Area of IT Security, Version 2.5, 28 March 2019

[PP_0099] Java Card System - Open Configuration Protection Profile, December 2017, Version 3.0.5, registered under the reference BSI-CC-PP-0099-2017

[RFC-5869] RFC 5869: HMAC-based Extract-and-Expand Key Derivation Function (HKDF), Request For Comments, May 2010

[ST] Security Target for JCOP 4.5 P71, Rev 1.4, 10 June 2022

[ST-lite] Security Target Lite for JCOP 4.5 P71, Rev. 1.4, 10 June 2022

[ST-SAN] ST sanitising for publication, CC Supporting Document CCDB-2006-04-004, April 2006

[TPM] TPM Rev. 2.0: Trusted Platform Module Library Specification, Family "2.0", Level 00, Revision 01.07, March 2014

[UM11225] NXP SE05x T=1 Over SPI/I2C Specification, doc. no. um11225, rev. 1.1, January 8 2020

[UM10204] I2C-bus specification and user manual, UM10204, Rev. 6, 4 April 2014

(This is the end of this report.)