LDS Applet V10

PACE with CAM, AA and CA Configuration

Public Security Target

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CONTRIBUTORS

Name	Role	Author	Reviewer	Approver
MESTIRI, Sarra	Security Manager	Yes		
YAP Abraham	Project Leader			

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1. INTRODUCTION

This Security Target Lite aims to satisfy the requirements of Common Criteria level EAL5+, augmented with AVA_VAN.5 and ALC_DVS.2 in defining the security enforcing functions of the Target Of Evaluation and describing the environment in which it operates.

The basis for this composite evaluation is the composite evaluation of Open Platforms COSMOV8.1-N - Platform and configurable JavaCard application, LDS V10.

The LDS application code is either activated in ROM during prepersonalization phase or loaded on the E2Prom of the platform at prepersonalisation or personalisation phase.

The LDS works on 2 platforms:

The first is ID-One Cosmo v8.1-N - Standard Platform', embeds the PIV 2.4 Application in ROM.

The second platform, 'ID-One Cosmo v8.1-N Large Platform' embeds the applications PIV 2.4 and IAS ECC V2 Applications in ROM. A new version of the ID-One Cosmo v8.1-N Large platform (ID-One Cosmo v8.1-N R2 Large) also embeds the LDS V10 application in ROM.

The 2 platforms have the same interfaces and covered by a unique security target [54].

All additional applications, romed or loaded in E2prom at pre perso or perso phase are out of the scope of the present evaluation, for example PIV2, IAS ECC V2.

1.1. Security Target Reference

The Security target is identified as follows:

Title:	Security Target JASON
Name:	LDS V10 Security Target PACE CAM CA AA
Oberthur Technologies registration:	FQR 110 8358 Issue 3

EAL: EAL5 augmented with AVA_VAN.5 and ALC_DVS.2, CC version 3.1, Revision 4.

PP: BSI-CC-PP - 0068 [50]

Authors:	Oberthur Technologies
ST Lite reference:	FQR 110 8495 Issue 1

Publication Date for the Public ST-Lite: January 2018

1.2. TOE Reference

Product name:	LDS V10 on ID-One Cosmo v8.1-N	LDS V10 on ID-One Cosmo v8.1-N R2
Commercial name of the TOE 1:	LDS V10: PACE configuration with CAM, AA and CA on ID-One Cosmo v8.1-N - Standard Platform	Not applicable

Commercial name of the TOE 2:	LDS V10: PACE configuration with CAM, AA and CA on ID-One Cosmo v8.1-N Large Platform	LDSV10: PACE configuration with CAM, AA and CA on ID-One Cosmo v8.1-N R2 Large Platform
Memory	E2PROM	ROM
Application **Reference Code**	0670012	0670012
Communication protocol	Contact, Contactless and Dual	Contact, Contactless and Dual
ST Cosmo v8.1-N reference	ERATO Security Target FQR 110 7986	ERATO Security Target FQR 110 7986

Table 1: TOE REFERENCES

1.3. TOE Identification

The aim of the paragraphs is to allow the user to identify uniquely the TOE.

The TOE is composed of application [LDS V10 Security Target PACE] and a COSMO v8-1n platform on the IC.

1.3.1.TOE Identification

This chapter presents the means to identify the evaluated application and the Platform.

The **[**LDS V10 Security Target PACE**]** installation command **shall** use the executable load File AID and module AID.

Name	**Value**
Executable Load File (ELF) AID	A0000000770100000071000000000005
Executable Module AID	A0000000770100000071000100000005
Application AID	A00000024710FF

Table 2: AID LDS V10 Security Target PACE Configuration

1.3.2.Platform Identification

In order to assure the authenticity of the card, the product identification shall be verified by analysing:.

TOE Name	ID-One Cosmo v8.1-N - Standard LDS Platform	ID-One Cosmo v8.1-N Large Platform	ID-One Cosmo v8.1-N R2 Large Platform
Mask / Hardware Identification	083621	084021	084022
Label PVCS code	COSMO_V81N_LDS_STANDARD_PLATFORM_R10	COSMO_V81N_LARGE_PLATFORM_R10	COSMO_V81N_LARGE_PLATFORM_R2
IC reference version	NXP P60D081	NXP P60D145	NXP P60D145
IC ST identification	NXP Secure Smart Card Controller P6021y VB Security Target Lite Rev. 1.51	NXP Secure Smart Card Controller P6022y VB Security Target Lite Rev. 1.52	NXP Secure Smart Card Controller P6022y VB Security Target Lite Rev. 1.52

	BSI-DSZ-CC-0955-V2-2016	BSI-DSZ-CC-0973-V2-2016	BSI-DSZ-CC-0973-V2-2016
IC EAL	EAL5 with augmentations: AVA_VAN.5, ALC_DVS.2, ASE_TSS.2	EAL5 with augmentations: AVA_VAN.5, ALC_DVS.2, ASE_TSS.2	EAL5 with augmentations: AVA_VAN.5, ALC_DVS.2, ASE_TSS.2
IC certificate	BSI-DSZ-CC-0955-V2-2016	BSI-DSZ-CC-0973-V2-2016	BSI-DSZ-CC-0973-V2-2016
Date of IC certification	11 October 2016	11 October 2016	11 October 2016
Reference of the Cosmo Platform certificate	ANSSI-CC-017/48	ANSSI-CC-2017/49	ANSSI-CC-2017/49-M01

Table 3: Platform Identification

The evaluated platform allows the loading of patch. The patch reference is specified in the platform ST for ID-One Cosmo v8.1-N and the associated platform certificate. The ID-One Cosmo v8.1-N R2 doesn’t include any patch.

1.3.3.Configuration of the platform

In the present evaluation, the loading of application (Java Card Applets) on the platform at use phase is allowed. It can be forbidden if requested by the product issuer.

1.4. Reference documents

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1.5. Definitions

DES	Data Encryption Standard
DF	Dedicated File
DH	Diffie Hellman
EAL	Evaluation Assurance Level
EF	Elementary File
EEPROM	Electrically Erasable Programmable Read Only Memory
FID	File identifier
GP	Global Platform
IC	Integrated Chip
ICC	Integrated Chip card
IFD	Interface Device
MAC	Message Authentication code
PIN	Personal Identification Number
PKI	Public Key Infrastructure
ROM	Read Only Memory
RSA	Rivest Shamir Adleman
RSA CRT	Rivest Shamir Adleman – Chinese Remainder Theorem
SCP	Secure Channel Procotol
SHA	Secure hashing Algorithm
TOE	Target of evaluation

1.6. Technical Terms Definition

Term	**Definition**
Active Authentication	Security mechanism defined in [6] option by which means the MRTD's chip proves and the inspection system verifies the identity and authenticity of the MRTD's chip as part of a genuine MRTD issued by a known State or Organization.
Audit records	Write-only-once non-volatile memory area of the MRTDs chip to store the Initialization Data and Pre-personalization Data.
Authenticity	Ability to confirm the MRTD and its data elements on the MRTD's chip were created by the issuing State or Organization.
Basic Access Control (BAC)	Security mechanism defined in [6] by which means the MRTD's chip proves and the inspection system protects their communication by means of secure messaging with Document Basic Access Keys (see there).
Basic Inspection System (BIS)	An inspection system which implements the terminals part of the Basic Access Control Mechanism and authenticates itself to the MRTD's chip using the Document Basic Access Keys derived from the printed MRZ data for reading the logical MRTD.
Biographical data (biodata)	The personalized details of the MRTD holder of the document appearing as text in the visual and machine readable zones on the biographical data page of a passport book or on a travel card or visa.
Biometric reference data	Data stored for biometric authentication of the MRTD holder in the MRTD's chip as (i) digital portrait and (ii) optional biometric reference data.
Counterfeit	An unauthorized copy or reproduction of a genuine security document made by whatever means.
Country Signing CA Certificate (Ccsca)	Self-signed certificate of the Country Signing CA Public Key (KPuCSCA) issued by CSCA stored in the inspection system.
Document Basic Access Keys	Pair of symmetric (two-key) Triple-DES keys used for secure messaging with encryption (key KENC) and message authentication (key KMAC) of data transmitted between the MRTD's chip and the inspection system. It is drawn from the

	printed MRZ of the passport book to authenticate an entity able to read the printed MRZ of the passport book.
Document Security Object (SOD)	A RFC3369 CMS Signed Data Structure, signed by the Document Signer (DS). Carries the hash values of the LDS Data Groups. It is stored in the MRTD's chip. It may carry the Document Signer Certificate (CDS).
Eavesdropper	A threat agent with Enhanced-Basic attack potential reading the communication between the MRTD's chip and the inspection system to gain the data on the MRTD's chip.
Enrolment	The process of collecting biometric samples from a person and the subsequent preparation and storage of biometric reference templates representing that person's identity.
Extended Access Control (EAC)	Security mechanism identified in [48] by which means the MRTD's chip (i) verifies the authentication of the inspection systems authorized to read the optional biometric reference data, (ii) controls the access to the optional biometric reference data and (iii) protects the confidentiality and integrity of the optional biometric reference data during their transmission to the inspection system by secure messaging. The Personalization Agent may use the same mechanism to authenticate themselves with Personalization Agent Private Key and to get write and read access to the logical MRTD and TSF data.
Extended Inspection System (EIS)	A role of a terminal as part of an inspection system which is in addition to Basic Inspection System authorized by the issuing State or Organization to read the optional biometric reference data and supports the terminals part of the Extended Access Control Authentication Mechanism.
Forgery	Fraudulent alteration of any part of the genuine document, e.g. changes to the biographical data or the portrait.
Global Interoperability	The capability of inspection systems (either manual or automated) in different States throughout the world to exchange data, to process data received from systems in other States, and to utilize that data in inspection operations in their respective States. Global interoperability is a major objective of the standardized specifications for placement of both eye-readable and machine readable data in all MRTDs.
IC Dedicated Support Software	That part of the IC Dedicated Software (refer to above) which provides functions after TOE Delivery. The usage of parts of the IC Dedicated Software might be restricted to certain phases.
IC Dedicated Test Software	That part of the IC Dedicated Software (refer to above) which is used to test the TOE before TOE Delivery but which does not provide any functionality thereafter.
IC Identification Data	The IC manufacturer writes a unique IC identifier to the chip to control the IC as MRTD material during the IC manufacturing and the delivery process to the MRTD manufacturer (i.e MRTD packaging responsible).
Impostor	A person who applies for and obtains a document by assuming a false name and identity, or a person who alters his or her physical appearance to represent himself or herself as another person for the purpose of using that person's document.
Improperly document person	A person who travels, or attempts to travel with: (a) an expired travel document or an invalid visa; (b) a counterfeit, forged or altered travel document or visa; (c) someone else's travel document or visa; or (d) no travel document or visa, if required.
Initialisation	Process of writing Initialisation Data (see below) to the TOE.
Initialization Data	Any data defined by the TOE Manufacturer and injected into the non-volatile memory by the Integrated Circuits manufacturer (Phase 2). These data are for instance used for traceability and for IC identification as MRTD's material (IC identification data).

Inspection	The act of a State examining an MRTD presented to it by a traveler (the MRTD holder) and verifying its authenticity.
Inspection System (IS)	A technical system used by the border control officer of the receiving State (i) examining an MRTD presented by the traveler and verifying its authenticity and (ii) verifying the traveler as MRTD holder.
Integrated Circuit (IC)	Electronic component(s) designed to perform processing and/or memory functions. The MRTD's chip is a integrated circuit.
Integrity	Ability to confirm the MRTD and its data elements on the MRTD's chip have not been altered from that created by the issuing State or Organization
Issuing Organization	Organization authorized to issue an official travel document (e.g. the United Nations Organization, issuer of the Laissez-passer).
Issuing State	The Country issuing the MRTD.
Logical Data Structure (LDS)	The collection of groupings of Data Elements stored in the optional capacity expansion technology. The capacity expansion technology used is the MRTD's chip.
Logical MRTD	Data of the MRTD holder stored according to the Logical Data Structure, as specified by ICAO on the contactless integrated circuit. It presents contactless readable data including (but not limited to) (1) personal data of the MRTD holder, (2) the digital Machine Readable Zone Data (digital MRZ data, EF.DG1), (3) the digitized portraits (EF.DG2), (4) the biometric reference data of finger(s) (EF.DG3) or iris image(s) (EF.DG4) or both and (5) the other data according to LDS (EF.DG5 to EF.DG16). (6) EF.COM and EF.SOD
Logical travel document	Data stored according to the Logical Data Structure as specified by ICAO in the contactless integrated circuit including (but not limited to) (1) data contained in the machine-readable zone (mandatory), (2) digitized photographic image (mandatory) and (3) fingerprint image(s) and/or iris image(s) (optional).
Machine Readable Travel Document (MRTD)	Official document issued by a State or Organization which is used by the holder for international travel (e.g. passport, visa, official document of identity) and which contains mandatory visual (eye readable) data and a separate mandatory data summary, intended for global use, reflecting essential data elements capable of being machine read.
Machine Readable Visa (MRV)	A visa or, where appropriate, an entry clearance (hereinafter collectively referred to as visas) conforming to the specifications contained herein, formulated to improve facilitation and enhance security for the visa holder. Contains mandatory visual (eye readable) data and a separate mandatory data summary capable of being machine read. The MRV is normally a label which is attached to a visa page in a passport.
Machine Readable Zone (MRZ)	Fixed dimensional area located on the front of the MRTD or MRP Data Page or, in the case of the TD1, the back of the MRTD, containing mandatory and optional data for machine reading using OCR methods.
Machine-verifiable biometrics feature	A unique physical personal identification feature (e.g. an iris pattern, fingerprint or facial characteristics) stored on a travel document in a form that can be read and verified by machine.
MRTD application	Non-executable data defining the functionality of the operating system on the IC as the MRTD's chip. It includes - the file structure implementing the LDS

	- the definition of the User Data, but does not include the User Data itself (i.e. content of EF.DG1 to EF.DG14, EF.DG 16, EF.COM and EF.SOD) and - the TSF Data including the definition the authentication data but except the authentication data itself.
MRTD Basic Access Control	Mutual authentication protocol followed by secure messaging between the inspection system and the MRTD's chip based on MRZ information as key seed and access condition to data stored on MRTD's chip according to LDS.
MRTD holder	The rightful holder of the MRTD for whom the issuing State or Organization personalized the MRTD.
MRTD's Chip	A contactless integrated circuit chip complying with ISO/IEC 14443 and programmed according to the Logical Data Structure as specified by ICAOT.
MRTD's chip Embedded Software	Software embedded in a MRTD's chip and not being developed by the IC Designer. The MRTD's chip Embedded Software is designed in Phase 1 and embedded into the MRTD's chip in Phase 2 of the TOE life-cycle.
Optional biometric reference data	Data stored for biometric authentication of the MRTD holder in the MRTD's chip as (i) encoded finger image(s) (EF.DG3) or (ii) encoded iris image(s) (EF.DG4) or (iii) both. Note that the European commission decided to use only finger print and not to use iris images as optional biometric reference data.
Passive authentication	(i) verification of the digital signature of the Document Security Object and (ii) comparing the hash values of the read LDS data fields with the hash values contained in the Document Security Object.
Personalization	The process by which the portrait, signature and biographical data are applied to the document. This may also include the optional biometric data collected during the "Enrolment" (Step 6).
Personalization Agent	The agent acting on the behalf of the issuing State or Organization to personalize the MRTD for the holder by (i) establishing the identity the holder for the biographic data in the MRTD, (ii) enrolling the biometric reference data of the MRTD holder i.e. the portrait, the encoded finger image(s) or (ii) the encoded iris image(s) and (iii) writing these data on the physical and logical MRTD for the holder.
Personalization Agent Authentication Information	TSF data used for authentication proof and verification of the Personalization Agent.
Personalization Agent Key	Symmetric cryptographic authentication key used (i) by the Personalization Agent to prove their identity and get access to the logical MRTD and (ii) by the MRTD's chip to verify the authentication attempt of a terminal as Personalization Agent according to the SFR FIA_UAU.4/BAC, FIA_UAU.5/BAC and FIA_UAU.6/BAC.
Physical travel document	Travel document in form of paper, plastic and chip using secure printing to present data including (but not limited to) (1) biographical data, (2) data of the machine-readable zone, (3) photographic image and (4) other data.
Pre-Personalisation	Process of writing Pre-Personalisation Data to the TOE including the creation of the MRTD Application (Step 5)
Pre-personalization Data	Any data that is injected into the non-volatile memory of the TOE by the MRTD Manufacturer (i.e IC manufacturer) (Phase 2) for traceability of non-personalized MRTD's and/or to secure shipment within or between life cycle phases 2 and 3. It contains (but is not limited to) the Active Authentication Key Pair and the Personalization Agent Key Pair.

Pre-personalized MRTD’s chip	MRTD’s chip equipped with an unique identifier and an unique asymmetric Active Authentication Key Pair of the chip.
Primary Inspection System (PIS)	An inspection system that contains a terminal for the contactless communication with the MRTD’s chip and does not implement the terminals part of the Basic Access Control Mechanism.
Random identifier	Random identifier used to establish a communication to the TOE in Phase 3 and 4 preventing the unique identification of the MRTD and thus participates in the prevention of traceability.
Receiving State	The Country to which the Traveler is applying for entry.
Reference data	Data enrolled for a known identity and used by the verifier to check the verification data provided by an entity to prove this identity in an authentication attempt.
Secondary image	A repeat image of the holder’s portrait reproduced elsewhere in the document by whatever means.
Secure messaging in encrypted mode	Secure messaging using encryption and message authentication code according to ISO/IEC 7816-4
Skimming	Imitation of the inspection system to read the logical MRTD or parts of it via the contactless communication channel of the TOE without knowledge of the printed MRZ data.
Travel document	A passport or other official document of identity issued by a State or Organization, which may be used by the rightful holder for international travel.
Traveler	Person presenting the MRTD to the inspection system and claiming the identity of the MRTD holder.
TSF data	Data created by and for the TOE, that might affect the operation of the TOE.
Unpersonalized MRTD	The MRTD that contains the MRTD Chip holding only Initialization Data and Pre-personalization Data as delivered to the Personalisation Agent from the Manufacturer.
User data	Data created by and for the user, that does not affect the operation of the TSF.
Verification	The process of comparing a submitted biometric sample against the biometric reference template of a single enrollee whose identity is being claimed, to determine whether it matches the enrollee’s template.
Verification data	Data provided by an entity in an authentication attempt to prove their identity to the verifier. The verifier checks whether the verification data match the reference data known for the claimed identity.

Table 4: Technical Terms Definition

2. TARGET OF EVALUATION

The product **LDS V10** is a multi-applicative Javacard product, embeddable in contact and/or contact-less smart card integrated circuits of different form factors. The product can be configured to serve different use cases, during the **Prepersonalization/personalization phases** of the product [60].

The product supports the storage and retrieval of structured information compliant to the Logical Data Structure as specified in [44]. It also provides standard authentication protocols, Extended Access Control [49] PACE [50], Active Authentication,...

It can host two types of applications as mentioned above, namely the IDL and **MRTD**. Moreover, further configuration may also be done to each type of application to serve use cases other than those behaviourally defined in the referenced normative documents.

This product is loaded on the platform, for details see ST [54]. Moreover, depending of the configuration, the TOE embeds other basic and certified application, for example HICOS application.

The LDS V10 product architecture can be viewed as shown in the following figure:

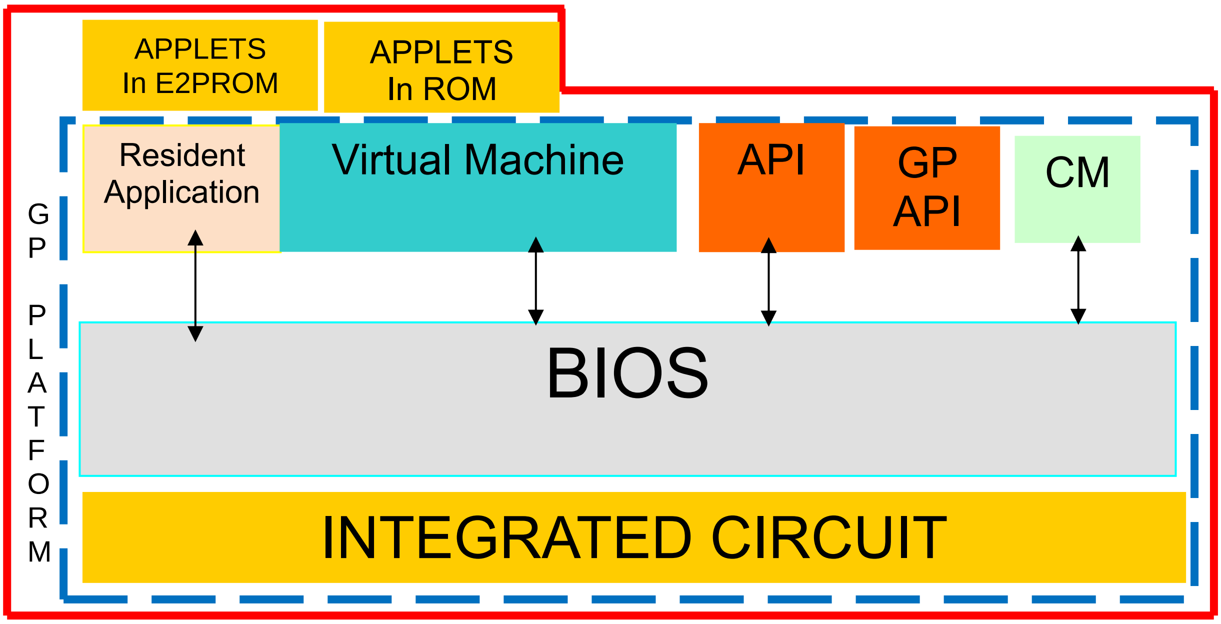


Figure 1: TOE Limits

2.1. TOE Overview

The Target of Evaluation (TOE) addressed by the current Security target is an electronic travel document representing a contactless / contact smart card1 programmed according to ICAO Technical Report "Supplemental Access Control" [53]. This smart card / passport provides the following application:

– the travel document containing the related user data including biometric as well as data needed for authentication including PACE passwords; this application is intended to be used by governmental organisations, amongst other as a machine readable travel document (MRTD).

The TOE described in this security target is the PACE configuration, conformant to **Configuration 1**. The product is composed of the functions: PACE/CA, PACE/CAM and AA ... all are presented in the chapter TOE architecture. Only some parts are in the scope of the evaluation of the present configuration.

Applets in ROM are PIV 2.4 and IAS ECC V2.

Different configurations of the TOE are under evaluation. This ST considers only PACE, AA, CA and CAM.

Configuration	PP Conformity	Chip		Extensions
		P60D081	P60D145	
1	**PP 0068 (PACE)**	**X**	**X**	**AA** **CA** **CAM**
2	PP0056v2 (EAC sur PACE)	X	X	AA CAM PACE-CAM/TA without CA BAC de-activation SM (DES + AES) on read DG3+DG4 After EAC
3	PP 0055 (BAC)	X	X	AA + CA
4	PP0056v1 (EAC sur BAC)	X	X	AA SM (DES + AES) on read DG3+DG4 after EAC

Table 5: 4 Configurations of the LDS application

All parts of the TOE are detailed in **§ 2.3**.

The TOE life cycle is described in **§** 3**.**

The TOE identification is described in **§ 1.3.1.**

2.1.1. TOE Usage and major security features

State or organisation issues MRTDs to be used by the holder to prove his/her identity and claiming associated rights. For instance, it can be used to check identity at customs in an MRTD configuration, verifying authenticity of electronic visa stored on the card and correspondence with the holder.

In order to pass successfully the control, the holder presents its personal MRTD to the inspection system to first prove his/her identity. The inspection system is under control of an authorised agent and can be either a desktop device such as those present in airports or a portable device to be used on the field.

The MRTD in context of this security target contains:

Visual (eye readable) biographical data and portrait of the holder printed in the booklet

A separate data summary (MRZ or keydoc data) for visual and machine reading using OCR methods in the Machine Readable Zone (MRZ or keydoc area)

And data elements stored on the TOE's chip for contact-less machine reading.

The authentication of the holder is based on:

The possession of a valid MRTD personalized for a holder with the claimed identity as given on the biographical data page and

The Biometric matching performed on the Inspection system using the reference data stored in the MRTD.

When holder has been authenticated the issuing State or Organization can performed extra authentications in order to gain rights required to grant access to some sensitive information such as “visa information”…

The issuing State or Organization ensures the authenticity of the data of genuine MRTDs. The receiving State trusts a genuine MRTD of an issuing State or Organization.

The MRTD can be viewed as the combination:

A physical MRTD in form of paper or plastic with an embedded chip and possibly an antenna. It presents visual readable data including (but not limited to)

- Personal data of the MRTD holder
- The biographical data on the biographical data page of the passport book
- The printed data in the Machine-Readable Zone (MRZ) or keydoc area that identifies the device
- The printed portrait

A logical MRTD as data of the MRTD holder stored according to the Logical Data Structure as specified by ICAO and extended in [44][45][46] on the contactless integrated circuit. It presents contact or contact-less readable data including (but not limited to)

- Personal data of the MRTD holder
- The digital Machine Readable Zone Data (digital MRZ data or keydoc data, DG1)
- The digitized portraits
- The optional biometric reference data of finger(s) or iris image(s) or both
- The other data according to LDS (up to DG24)
- The Document security object

The issuing State or Organization implements security features of the MRTD to maintain the authenticity and integrity of the MRTD and its data. The MRTD as the physical device and the MRTD’s chip is uniquely identified by the document number.
The physical MRTD is protected by physical security measures (e.g. watermark on paper, security printing), logical (e.g. authentication keys of the MRTD’s chip) and organisational security measures (e.g. control of materials, personalization procedures). These security measures include the binding of the MRTD’s chip to the physical support.

The logical MRTD is protected in authenticity and integrity by a digital signature created by the document signer acting for the issuing State or Organization and the security features of the MRTD’s chip.

The ICAO defines the baseline security methods Passive Authentication and the optional advanced security methods Basic Access Control to the logical travel document, Active Authentication of the travel document’s chip, Extended Access Control to and the Data Encryption of sensitive biometrics as optional security measure in the ICAO Doc 9303, and Password Authenticated Connection Establishment. The Passive Authentication Mechanism is performed completely and independently of the TOE by the TOE environment.

The security Target addresses the protection of the logical travel document (i) in integrity by write-only-once access control and by physical means, and (ii) in confidentiality by the Extended Access Control Mechanism. This protection profile addresses the Chip Authentication Version 1 as an alternative to the Active Authentication.

If BAC is supported by the TOE, the travel document has to be evaluated and certified separately. This is due to the fact that [47] does only consider extended basic attack potential to the Basic Access Control Mechanism (i.e. AVA_VAN.3).

The Active Authentication authenticates the contactless IC by signing a challenge sent by the IFD (inspection system) with a private key known only to the IC. For this purpose the contactless IC contains its own Active Authentication Key pair (KPrAA and KPuAA). A hash representation of Data Group 15 (Public Key (KPuAA) info) is stored in the Document Security Object (SOD) and therefore authenticated by the issuer's digital signature. The corresponding Private Key (KPrAA) is stored in the contactless IC's secure memory. By authenticating the visual MRZ (through the hashed MRZ in the Document Security Object (SOD)) in combination with the challenge response, using the eMRTD's Active Authentication Key Pair (KPrAA and KPuAA), the inspection system verifies that the Document Security Object (SOD) has been read from the genuine contactless IC, stored in the genuine eMRTD.

The confidentiality by Password Authenticated Connection Establishment (PACE) is a mandatory security feature of the TOE. The travel document shall strictly conform to the 'Common Criteria Protection Profile Machine Readable Travel Document using Standard Inspection Procedure with PACE considers high attack potential.

For the PACE protocol, the following steps shall be performed:

1. The travel document's chip encrypts a nonce with the shared password, derived from the MRZ resp. CAN data and transmits the encrypted nonce together with the domain parameters to the terminal.

2. The terminal recovers the nonce using the shared password, by (physically) reading the MRZ resp. CAN data.

3. The travel document's chip and terminal computer perform a Diffie-Hellmann key agreement together with the ephemeral domain parameters to create a shared secret. Both parties derive the session keys KMAC and KENC from the shared secret.

4. Each party generates an authentication token, sends it to the other party and verifies the received token.

After successful key negotiation the terminal and the travel document's chip provide private communication (secure messaging).

The protection profile requires the TOE to implement the Extended Access Control. The Extended Access Control consists of two parts (i) the Chip Authentication Protocol Version 1 and (ii) the Terminal Authentication Protocol Version 1 (v.1).

The Chip Authentication Protocol v.1 (i) authenticates the travel document's chip to the inspection system and (ii) establishes secure messaging which is used by Terminal Authentication v.1 to protect the confidentiality and integrity of the sensitive biometric reference data during their transmission from the TOE to the inspection system. Therefore Terminal Authentication v.1 can only be performed if Chip Authentication v.1 has been successfully executed.

The Terminal Authentication Protocol v.1 consists of (i) the authentication of the inspection system as entity authorized by the receiving State or Organisation through the issuing State, and (ii) an access control by the TOE to allow reading the sensitive biometric reference data only to successfully authenticated authorized inspection systems.

The issuing State or Organisation authorizes the receiving State by means of certification the authentication public keys of Document Verifiers who create Inspection System Certificates.

2.2. TOE Definition

The Target of Evaluation (TOE) is the contactless integrated circuit chip of machine readable travel documents (MRTD's chip) programmed according to the Logical Data Structure (LDS) and providing and provides standard authentication protocols, namely Basic Access Control, Extended Access Control and Active Authentication.

The product can be configured to serve different use cases, during the **Prepersonalization/personalization phases** of the product.

The TOE comprises at least:

- Circuitry of the MRTD's chip (the integrated circuit, IC)
- IC Dedicated Software with the parts IC Dedicated Test Software and IC Dedicated Support Software
- Cosmo V8-1N Standard or Large
- API
- LDS V10 application
- Associated guidance documentation

The platform provides an operational environment for the application: all cryptographic algorithm implementations and associated self-tests, random number and key generation, card lifecycle management, and key storage and protection are provided by the platform. The code for this functionality is contained in the platform ROM. However, the factory configuration of the module constrains the module to the set of services provided by the platform's Card Manager (implementing a standard set of GlobalPlatform services),

Some applications present on the Cosmo v8.1-N Platform are not usable on this TOE such as the PIV applet which is not instantiated.

The applet may be used on a contact mode compliant to ISO/IEC 7816-3 specification or on contactless mode compliant to ISO/IEC 14443 specification.

2.3. TOE Architecture

The TOE is a smartcard, composed of IC, Javacard Platform and the LDS application. Other applications may reside in the TOE.

2.3.1. Integrated Circuit

The TOE is embedded on NXP chips, more information on the chips is given in the related public Security Targets lites identified in table 3 of chapter 1.3.2**.**

2.3.2. JavaCard Platform

The Operating System is based on Java Card Technology and Global Platform technology. His main responsibilities are:

- providing interface between the Integrated Circuit and the applet
- providing to the applet, basic services to access to memories and all needed cryptographic operations
- ensuring global management of the card (loading, installation and deletion of applets) and monitor the security of the card (data integrity and physical attacks counter-measures). For details see [54].

2.3.3. Application Functionalities

This application stores the personal information related to the cardholder of an MRTD or an IDL. It also allows governmental organizations to retrieve these pieces of data.

The applet supports the authentication mechanisms described in ICAO and EAC specifications and ISO/IEC 18013-3 ISO Compliant Driving License specification with a fully configurable access control management over the EFs (EFs).

The applet may be used on a contact mode (compliant to ISO/IEC 7816-3 specification) and/or contactless mode (compliant to ISO/IEC 14443 specification).

The compliancy of the applet to LDS, EAC, or IDL, is achieved provided a correct personalization is performed. The correct authentication mechanisms and access conditions over the EFs must be assigned.

In summary, the applet supports the following authentication mechanisms stated in the ICAO specifications (for MRTD) and the ISO Compliant Driving License standard (for IDL):

- Active Authentication (AA)
- Basic Access Control (BAC)
- Password Authenticated Connection Establishment (PACE)
- Extended Access Control (EAC)
- Chip Authentication Mapping (CAM)
- Terminal Authentication (TA)

All authentication mechanisms are listed in the following chapters, all are part of the product but only some are part of the present evaluation.

2.3.3.1. Active Authentication (AA)

Active Authentication is an authentication mechanism ensuring the chip is genuine. It uses a challenge-response protocol between the IS and the chip.
Active Authentication is realized with the INTERNAL AUTHENTICATE command.
The key and algorithms supported are the following:

- RSA ISO/IEC 9796-2 with a key length of 1024 bits, 1536 bits or 2048 bits and hashing algorithm of SHA1 or SHA2.
- ECDSA over prime field curves with hashing algorithm of SHA1 or SHA2 and the key sizes 192 to 512.
- AES-256 using ISO/IEC 9797-1 M2 padding method.
- TDES with double and triple length keys using ISO/IEC 9797-1 M2 padding method.

2.3.3.2. Basic Access Control (BAC)

The protocol for Basic Access Control is specified by ICAO [47] Basic Access Control checks that the terminal has physical access to the MRTD's data page. This is enforced by requiring the terminal to derive an authentication key from the optically read MRZ of the MRTD. The protocol for Basic Access Control is based on ISO/IEC 11770-2 [41] key establishment mechanism 6. This protocol is also used to generate session keys that are used to protect the confidentiality (and integrity) of the transmitted data.

The Basic Access Control (BAC) is a security feature that is supported by the TOE. The inspection system:

- Reads the printed data in the MRZ (for MRTD),
- Authenticates itself as inspection system by means of keys derived from MRZ data. After successful 3DES based authentication, the TOE provides read access to data requiring BAC rights by means of a private communication (secure messaging) with the inspection system.

The purpose of this mechanism is to ensure that the holder gives access to the IS to the logical MRTD (data stored in the chip); It is achieved by a mutual authentication.

Once the mutual authentication is performed, a secure messaging is available to protect the communication between the chip and the IS.

This table lists the supported configurations for BAC protocol:

Configuration	Key Algo	Key Length	Hash Algo	MAC Algo
BAC	3DES 2Key	16-bytes	SHA-1	Retail MAC

Table 6: BAC Configuration

2.3.3.3. Terminal Authentication

The Terminal Authentication Protocol is a two move challenge-response protocol that provides explicit unilateral authentication of the terminal.

This protocol enables the MRTD chip to verify that the terminal is entitled to access sensitive data. As the terminal may access sensitive data afterwards, all further communication MUST be protected appropriately. Terminal Authentication therefore also authenticates an ephemeral public key chosen by the terminal that was used to set up Secure Messaging with Chip Authentication. The MRTD chip MUST bind the terminal's access rights to Secure Messaging established by the authenticated ephemeral public key of the terminal.

2.3.3.4. Chip Authentication

The Chip Authentication Protocol is an ephemeral-static Diffie-Hellman key agreement protocol that provides secure communication and unilateral authentication of the MRTD chip.

The protocol establishes Secure Messaging between an MRTD chip and a terminal based on a static key pair stored on the MRTD chip. Chip Authentication is an alternative to the optional ICAO Active Authentication, i.e. it enables the terminal to verify that the MRTD chip is genuine but has two advantages over the original protocol:
Challenge Semantics are prevented because the transcripts produced by this protocol are non-transferable.
Besides authentication of the MRTD chip this protocol also provides strong session keys.

The protocol in version 1 provides implicit authentication of both the MRTD chip itself and the stored data by performing Secure Messaging using the new session keys.

The protocol in Version 2 provides explicit authentication of the MRTD chip by verifying the authentication token and implicit authentication of the stored data by performing Secure Messaging using the new session keys.

2.3.3.5. Password Authenticated Connection Establishment (PACE)

PACE is an access control mechanism that is supplemental to BAC. It is a cryptographically stronger access control mechanism than BAC since it uses asymmetric cryptography compared to BAC's symmetric cryptography.

PACE is realized through 5 commands:

1. MSE SET – AT command
2. GENERAL AUTHENTICATE command – Encrypted Nonce
3. GENERAL AUTHENTICATE command – Map Nonce
4. GENERAL AUTHENTICATE command – Perform Key Agreement
5. GENERAL AUTHENTICATE command – Mutual Authentication

Once the mutual authentication is performed, a secure messaging is available to protect the communication between the chip and the IS.

This table lists the supported configurations for PACE protocol:

Configuration	Mapping	Key Algo	Key Length (in bytes)	Secure Messaging	Auth. Token	Hash Algo
PACE–ECDH–GM–3DES	Generic	3DES 2Key	16	CBC / Retail MAC	Retail MAC	SHA-1
PACE–ECDH–GM–AES–128	Generic	AES	16	CBC / CMAC	CMAC	SHA-1

PACE–ECDH–GM–AES–192	Generic	AES	24	CBC / CMAC	CMAC	SHA-256
PACE–ECDH–GM–AES–256	Generic	AES	32	CBC / CMAC	CMAC	SHA-256
PACE–ECDH–IM–3DES	Integrated	3DES 2Key	16	CBC / Retail MAC	Retail MAC	SHA-1
PACE–ECDH–IM–AES–128	Integrated	AES	16	CBC / CMAC	CMAC	SHA-1
PACE–ECDH–IM–AES–192	Integrated	AES	24	CBC / CMAC	CMAC	SHA-256
PACE–ECDH–IM–AES–256	Integrated	AES	32	CBC / CMAC	CMAC	SHA-256
PACE–ECDH–CAM–AES–128	Chip Authentication	AES	16	CBC / CMAC	CMAC	SHA-1
PACE–ECDH–CAM–AES–192	Chip Authentication	AES	24	CBC / CMAC	CMAC	SHA-256
PACE–ECDH–CAM–AES–256	Chip Authentication	AES	32	CBC / CMAC	CMAC	SHA-256

Table 7: PACE Configuration

2.3.3.6. Extended Access Control (EAC)

EAC is an authentication protocol based on a PKI infrastructure. It further ensures that the IS is authorized to read and/or update data stored in the applet. This authentication mechanism generates a strong secure messaging session through the step of Chip Authentication.

This mechanism is realized by the following steps:

1. Chip Authentication (CA)Chip Authentication is achieved by using a MANAGE SECURITY ENVIRONMENT – SET – Key Agreement Template (MSE SET KAT) command or by using a MANAGE SECURITY ENVIRONMENT – SET – Authentication Template (MSE SET AT) command followed by GENERAL AUTHENTICATE command.

The Chip Authentication mechanism enables the authentication of the chip by using an authenticated DH scheme. It may be realized in two ways:

- Classical DH (DH El Gamal) with key length of 1024, 1536, or 2048 bits
- DH over Elliptic curves over prime fields (ECDH) with the key length supported by the underlying Javacard platform.

2. Certificate Chain Handling

The certificate chain is processed through a series of MANAGE SECURITY ENVIRONMENT – SET – Digital Signature Template (MSE SET DST) and PERFORM SECURITY OPERATION – Verify Certificate (PSO VERIFY) commands.

The chain is done to extract a key from the IS certificate, the key which will be used in the Terminal Authentication.

3. Terminal Authentication (TA)

Terminal Authentication is achieved by using an EXTERNAL AUTHENTICATE command.

The Terminal Authentication mechanism is an authentication of the IS based on a classical challenge/response scheme. The signature scheme may be:
ECDSA SHA-1, ECDSA SHA-224, ECDSA SHA-256, ECDSA SHA-384, or ECDSA SHA-512 on elliptic curves over prime field with key length supported by the underlying Javacard platform
RSA SHA-1, SHA-256, or SHA-512 (PKCS#1 v1.5 or PKCS#1 v2.1 - PSS) with a key length of 1024, 1536, and 2048 bits.

2.3.3.7. PACE-CAM

The Chip Authentication Mapping is a new mapping for PACE which extends the Generic Mapping that integrates Chip Authentication into the PACE protocol. This mapping combines PACE and Chip Authentication into one protocol PACE-CAM, which allows faster execution than the separate protocols (i.e. PACE + CA + TA).

PACE-CAM is realized the same way as § 2.3.3.6. The only difference is that the chip computes the Chip Authentication Data using the chip's static private key then sends this data to the terminal. The terminal verifies the authenticity of the chip using the recovered Chip Authentication Data.

2.3.3.8. Match On-Card (MOC) Verification

MOC verification may be used to grant some access rights to EFs.

This feature relies on the services provided by the CHV Server applet MOC verification is supported if the *CHV Configuration* is properly configured in the install parameter. Once the MOC verification is allowed the applet will permit the use of CHV-related commands that handles biometric and Global PIN credentials.

2.3.3.9. PIN

The product supports the management of card holder credentials such as Cardholder PIN and Global PIN which can be used to grant access rights to EFs or keys. The Cardholder PIN and Global PIN each have its PIN Unblocking Key (Cardholder PUK and Global PUK, respectively). These PINs and corresponding PUKs have to be initialized during personalization if they are used to pdrotect access to EFs and keys.

2.3.3.10. BAC De-Activation

The TOE supports the automatic deactivation of BAC protocol at defined date.

2.3.3.11. Watermarking

The watermarking feature may be used to restrict the access to the plain image data of particular EF(s). Enabling the watermarking will cause the image data to be corrupted during the reading of the file contents.

The de-watermarking conditions should be configured accordingly and these conditions must be satisfied in order to grant access to the plain image data, details are in the dedicated security Target.

2.3.3.12. Secure Messaging

The TOE supports the ISO Secure Messaging. It provides a secure channel (i.e. encrypted and authenticated) between application and terminal. Secure Messaging can be set up by Chip Authentication, PACE, or Basic Access Control. The provided security level depends on the mechanism used to set up Secure Messaging.

A session is started when secure messaging is established. The session only ends with the release of secure messaging, e.g. by sending a command without secure messaging.

2.3.3.13. OT Cryptographic library

A dedicated cryptographic library has been developed and designed by Oberthur Technologies.

This cryptographic library is embedded on the TOE to provide the highest security level and best tuned performances. It is implemented at the platform level and are already in the scope of the platform evaluation.

2.3.3.14. Additional applications

Additional java card applications are present in the TOE: PIV 2.4 and IAS ECC V2, … These applications are outside the scope of the present evaluation.

2.3.4. Mechanism included in the scope of the evaluation

All TOE functionalities are presented in the previous chapter.
The present evaluation includes the listed functionalities:

- AA
- CA
- CAM
- PACE
- All crypto functions
- Personalization functions

2.4. Reference

The TOE is identified as follows:

Application Guidance	
TOE name (commercial name)	LDS V10 on ID-One Cosmo v8.1-N
Guidance document for preparation	Personalization Manual [60]
Guidance document for operational use	User Manual [61]
Platform Guidance	
Guidance document for Platform Pre-personalisation	COSMO V8.1-N Pre-Perso Guide[57]
Developer of sensitive applications*	COSMO V8.1-N Security Recommendations [56]
Guidance for application developer*	COSMO V8.1-N Reference Guide [58]
Guidance to Issuer of the platform that aims to load applications*	COSMO V8.1-N Application Loading Protection Guidance [55]

Table 8: TOE Guidance REFERENCES

3. TOE LIFE CYCLE

3.1. TOE Life Cycle Overview

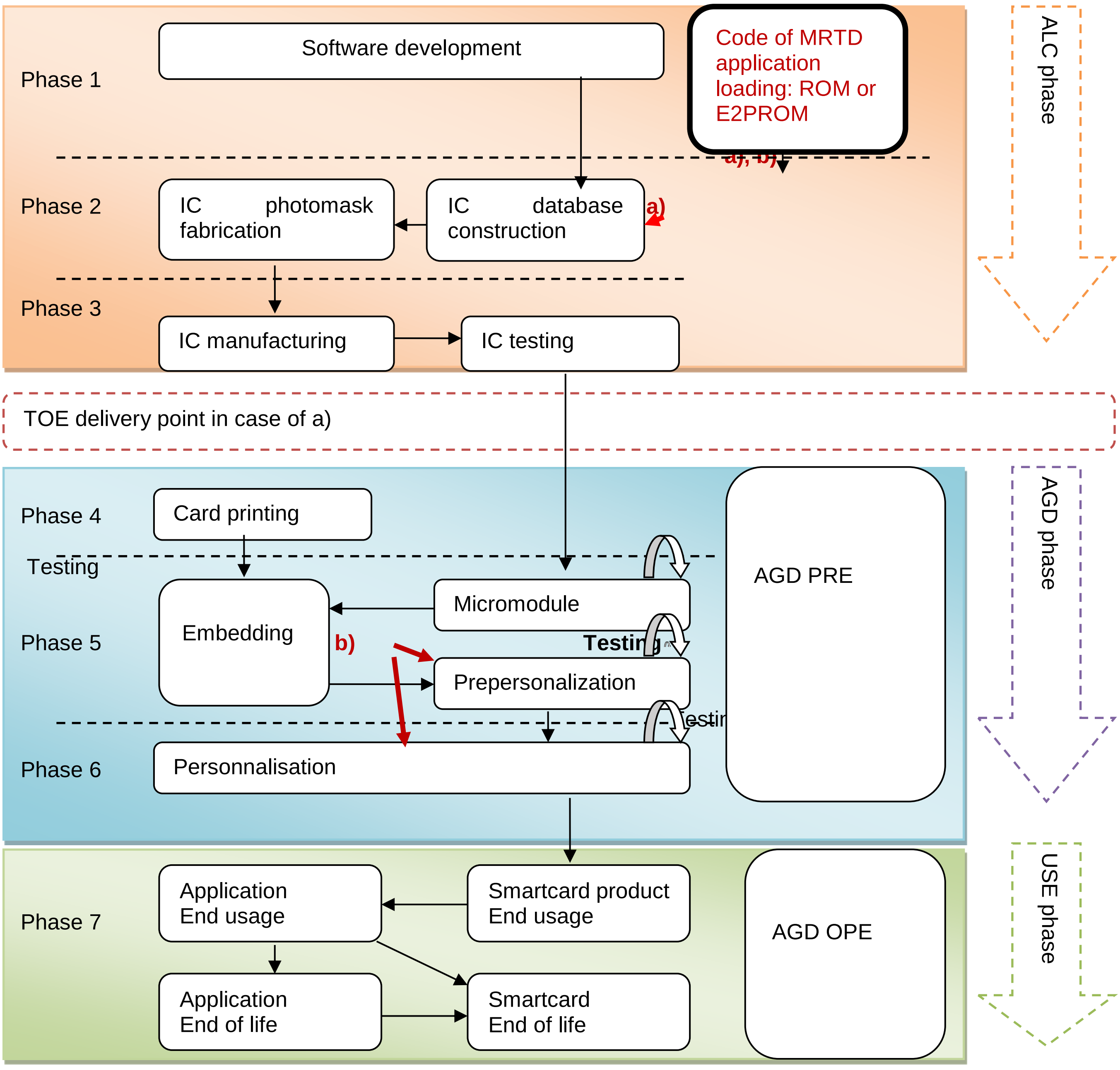


Figure 2: Smartcard product life-cycle for the TOE

The TOE life-cycle classically described in terms of four life-cycle phases, is additionally subdivided into 7 steps.

The roles involved in the different steps are listed in the following table:

Roles	Subjects
IC manufacturer	NXP Semiconductors
TOE developer	Oberthur Technologies
Manufacturer	NXP Semiconductors

	Oberthur Technologies or another agent
Prepersonalizer	Oberthur Technologies or another agent
Personalization Agent	Oberthur Technologies or another agent

Table 9: Roles Identification on the life cycle.

3.2. TOE Life Cycle when the Application code is romed

The table below presents the subjects following TOE life cycle steps in accordance with the standard smart card life cycle, the Protection Profile lifecycle in phases, the TOE delivery point and the coverage in the case a).

Steps	Phase	Subject	Covered by	Sites
Step 1	Development	Oberthur Technologies	ALC R&D sites	-Pessac and Colombes for platform and -Manille for LDS V10 application development
Step 2	Development	NXP Semiconductors	IC certification	IC certification
Step 3	Manufacturing	NXP Semiconductors	IC certification	IC certification
TOE delivery point				
Step 4	Manufacturing	MRD Manufacturer (Prepersonalizer)	AGD_PRE	
Step 5	Manufacturing	MRD Manufacturer (Prepersonalizer)	AGD_PRE	
Step 6	Personalization	Personalization Agent	AGD_PRE	
Step 7	Operational Use	End user	AGD_OPE	

Table 10: Subjects identification following life cycle steps

Details for each phase/step are presented in the following paragraphs.

3.3. Phase 1 “Development”

(Step1) The TOE is developed in phase 1. The IC developer develops the integrated circuit, the IC Dedicated Software and the guidance documentation associated with these TOE components.
The TOE includes the LDS V10 application and the Platform.
The LDS is developed at Manille and the platform at Colombes and Pessac.
The sites are audited following MSSR last requirements.

(Step2) The TOE developer uses the guidance documentation for the integrated circuit and the guidance documentation for relevant parts of the IC Dedicated Software and develops the IC Embedded Software (operating system), the MRTD application and the guidance documentation associated with these TOE components.

The manufacturing documentation of the IC including the IC Dedicated Software and the Embedded Software in the non-volatile non-programmable memories is securely delivered to the IC manufacturer. The IC Embedded Software in the non-volatile programmable memories, the eMRTD application and the guidance documentation is securely delivered to the Manufacturer.

3.4. Phase 2 “Manufacturing”

(Step3) In a first step the TOE integrated circuit is produced containing the travel document’s chip Dedicated Software and the parts of the travel document’s chip Embedded Software in the non-volatile non-programmable memories (ROM). The IC manufacturer writes the IC Identification Data onto the chip to control the IC as travel document material during the IC manufacturing and the *delivery process to the Manufacturer. The IC is securely delivered from the IC manufacture to the* Manufacturer. If necessary the IC manufacturer adds the parts of the IC Embedded Software in the non-volatile programmable memories (for instance EEPROM). The IC manufacturer adds initialization data in EEPROM and keys (MSK, LSK).

The end of step 3 is the TOE delivery.

(Step4) The Manufacturer combines the IC with hardware for the contact based / contactless interface in the travel document unless the travel document consists of the card only.

(Step5) The Manufacturer (i) adds the IC Embedded Software (ii) creates the eMRTD application, and (iii) equips travel document's chips with pre-personalization Data.

The pre-personalised travel document together with the IC Identifier is securely delivered from the Manufacturer to the Personalization Agent. The Manufacturer also provides the relevant parts of the guidance documentation to the Personalization Agent.

3.5. Phase 3 "Personalization of the travel document"

(Step6) The personalization of the travel document includes:
(i) the survey of the travel document holder's biographical data,
(ii) the enrolment of the travel document holder biometric reference data (i.e. the digitized portraits and the optional biometric reference data),
(iii) the personalization of the visual readable data onto the physical part of the travel document,
(iv) the writing of the TOE User Data and TSF Data into the logical travel document and
(v) configuration of the TSF if necessary.

The step (iv) is performed by the Personalization Agent and includes but is not limited to the creation of
(i) the digital MRZ data (EF.DG1),
(ii) the digitized portrait (EF.DG2), and
(iii) the Document security object. The signing of the Document security object by the Document signer finalizes the personalization of the genuine travel document for the travel document holder.
The personalised travel document (together with appropriate guidance for TOE use if necessary) is handed over to the travel document holder for operational use.

3.5.1. Loading of application

The platform can host 2 kinds of applications: Evaluated sensitive applications and validated basic applications. Once the application is evaluated or validated, it is securely delivered to manufacturing site. This delivery ensures the integrity and confidentiality of the application code and data. Then applications code and data are securely stored.
The delivery, storage and loading of any application are covered by audited Organisational measures (ALC).

Applications can be loaded at pre issuance at step 5 or at step 6 or in post issuance.

3.5.2. Applet pre-personalisation (phase 6)

This phase is performed by the Personalisation Agent, which controls the TOE. During this phase, the javacard applet is prepared as required by P.TOE_Construction.
All along this phase, the TOE is self-protected as it requires the authentication of the Personalisation Agent prior to any operation.

3.5.3. TOE personalisation (phase 6)

This phase is performed by the Personalisation Agent, which controls the TOE, which is in charge of the javacard applet personalisation.

All along this phase, the TOE is self-protected as it requires the authentication of the Personalisation Agent prior to any operation.
This phase may not necessarily take place in a manufacturing site, but may be performed anywhere. The Personalisation Agent is responsible for ensuring a sufficient level of security during this phase.
The javacard applet is personalized according to guidance document [57].

At the end of phase 6, the TOE is constructed.

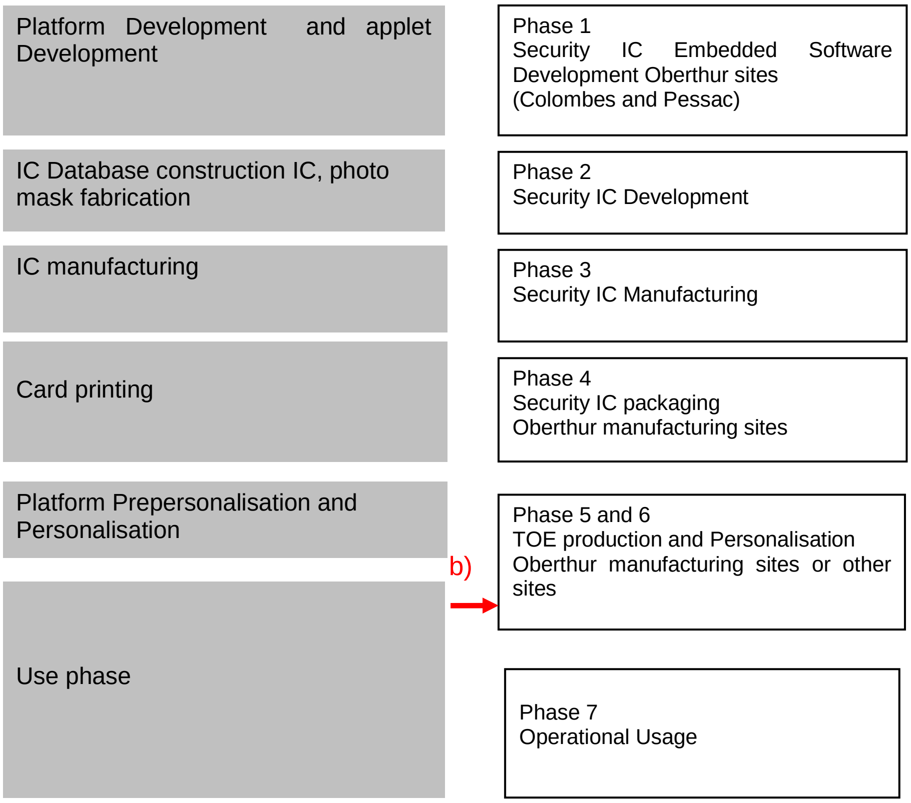
3.6. Phase 4 “Operational Use”

(Step7) The TOE is used as a travel document's chip by the traveller and the inspection systems in the “Operational Use” phase. The user data can be read according to the security policy of the issuing State or Organisation and can be used according to the security policy of the issuing State but they can never be modified.

Note that the personalization process and its environment may depend on specific security needs of an issuing State or Organisation. All production, generation and installation procedures after TOE delivery up to the “Operational Use” (phase 4) have to be considered in the product evaluation process under AGD assurance class. Therefore, the Security Target has to outline the split up of P.Manufact, P.Personalization and the related security objectives into aspects relevant before vs. after TOE delivery. Some production steps, e.g. Step 4 in Phase 2 may also take place in the Phase 3.

3.7. TOE Life Cycle when the Application code is loaded in E2prom

This chapter presents when the application in loaded in E2prom, case b.


Platform Development and applet Development
Phase 1
Security IC Embedded Software Development Oberthur sites (Colombes and Pessac)
IC Database construction IC, photo mask fabrication
Phase 2
Security IC Development
IC manufacturing
Phase 3
Security IC Manufacturing
Card printing
Phase 4
Security IC packaging
Oberthur manufacturing sites
Platform Prepersonalisation and Personalisation
b)
Phase 5 and 6
TOE production and Personalisation
Oberthur manufacturing sites or other sites
Use phase
Phase 7
Operational Usage

!

Figure 3: Smartcard product life-cycle for the TOE when the application is loaded in E2prom.

When the LDS application is loaded on the Platform at Phase 5; the entity responsible of the loading is the manufacturer:

- The Manufacturer (phase 5) loads the LDS application code (ii) creates the eMRTD application, and (iii) equips travel document's chips with pre-personalization Data.
- The pre-personalised travel document together with the IC Identifier is securely delivered from the Manufacturer to the Personalization Agent. The Manufacturer also provides the relevant parts of the guidance documentation to the Personalization Agent (AGD_PRE).

When the LDS application is loaded on the Platform at Phase 6; the entity responsible of the loading is the Personalization Agent:

- The Personalization Agent (phase 6) loads the LDS application code (ii) creates the eMRTD application, and (iii) equips travel document's chips with pre-personalization Data.
- The MRTD is also personalized, in this step, as defined in the chapter 3.5.3.
- The personalization phase can also occur in phase 7, by the Issuer.

When the LDS application is loaded on the Platform at Phase 7; the entity responsible of the loading is the issuer, the Prepersonalization and the personalisation of the MRTD is under the Issuer responsibility. All required information is securely given (application code and AGD_PRE and AGD_OPE). The loading follows Platform requirements as defined in the COSMO V8.1-N Application Loading Protection Guidance [55].

Step	Possible operations	Required document form the platform	Required document form the application
Step 5	MRD Manufacturer (Prepersonalizer) Loading and Prepersonalization	COSMO V8.1-N Application Loading Protection Guidance [55]	Application code Personalization Manual [60]
Step 6	Loading and Prepersonalization and personalisation	COSMO V8.1-N Application Loading Protection Guidance [55]	Application code Personalization Manual [60]
Step 7	Loading and Prepersonalization and personalisation	COSMO V8.1-N Application Loading Protection Guidance [55]	Application code Personalization Manual [60] User Manual [61]

Table 11: Required inputs for each case

4. CONFORMANCE CLAIM

4.1. Conformance claim

This security target claims conformance to the Common Criteria version 3.1, revision 4 ([1][2][3]). The conformance to the Common Criteria is claimed as follows:

CC	Conformance rationale
Part 1	Strict conformance
Part 2	Conformance to the extended[1] part: FAU_SAS.1 “Audit Storage” FCS_RND.1 “Quality metric for random numbers” FMT_LIM.1 “Limited capabilities” FMT_LIM.2 “Limited availability” FPT_EMS.1 “TOE Emanation” FIA_API.1 “Authentication Proof of Identity”
Part 3	Strict conformance to Part 3. The product claims conformance to EAL 5, augmented with: ALC_DVS.2 “Sufficiency of security measures” AVA_VAN.5 ”Advanced methodical vulnerability analysis”

Table 12: Conformance Rationale

4.2. Protection Profile claims

This security target claims a strict conformance to the following protection profile:

- BSI-CC-PP-0068-V2-2011: ”Machine Readable Travel Document using Standard Inspection Procedure with PACE” [50]

4.1. Life Cycle Conformance

The TOE life cycle is presented in § 3.
New users have been defined, that have specific role, as described in the following table.

Additional subjects	Description
IC developer	Developer of the IC
IC manufacturer	This additional subjet is a refinement of the role Manufacturer It is Manufacturer of the IC
TOE developer	Developer of part of the TOE source code
Prepersonalizer	Agent in charge of the prepersonalization This additional subjet is a refinement of the role Manufacturer . It is the agent in charge of the prepersonalization of the TOE. It corresponds to the MRTD manufacturer

Table 13: Additional subjects

4.2. Protection Profile Additions

The rationale between the SPD, taking into account the additional elements of the SPD, and the Objectives and Objectives on the operational environment are given in the paragraph Rationales.

For ease the manipulation of security objectives and threats, the names are reduced. For example: OT.Data_Int is in the PP OT.Data_Integrity. The PP name is under brackets.

[1] *The rationale for SFR addition is described in the relative PP*

4.2.1. SFR dispatch versus PP

The following table present a rationale between the SFR driven from the protection profile versus the SFR from this security target:

SFR from the PP	Dispatch in the ST
FCS_CKM.1/DH_PACE	FCS_CKM.1/DH_PACE_AES FCS_CKM.1/DH_PACE_3DES FCS_CKM.1/ECDH_PACE_AES FCS_CKM.1/ECDH_PACE_3DES
FCS_CKM.4	FCS_CKM.4/Global
FCS_COP.1/PACE_ENC	FCS_COP.1/PACE_ENC_3DES FCS_COP.1/PACE_ENC_AES
FCS_COP.1/PACE_MAC	FCS_COP.1/PACE_MAC_AES FCS_COP.1/PACE_MAC_3DES
FCS_RND.1	FCS_RND.1/Global
FIA_AFL.1/PACE	FIA_AFL.1/PACE
FIA_UID.1/PACE	FIA_UID.1/PACE
FIA_UAU.1/PACE	FIA_UAU.1/PACE
FIA_UAU.4/PACE	FIA_UAU.4/PACE
FIA_UAU.5/PACE	FIA_UAU.5/PACE
FIA_UAU.6/PACE	FIA_UAU.6/PACE
FDP_ACC.1/TRM	FDP_ACC.1/TRM
FDP_ACF.1/TRM	FDP_ACF.1/TRM
FDP_RIP.1	FDP_RIP.1
FDP_UCT.1/TRM	FDP_UCT.1/TRM
FDP_UIT.1/TRM	FDP_UIT.1/TRM
FTP_ITC.1/PACE	FTP_ITC.1/PACE
FAU_SAS.1	FAU_SAS.1/MP
FMT_SMF.1	FMT_SMF.1/MP
FMT_SMR.1/PACE	FMT_SMR.1/MP FMT_SMR.1/PACE
FMT_LIM.1	FMT_LIM.1/Global
FMT_LIM.2	FMT_LIM.2/Global
FMT_MTD.1/INI_ENA	FMT_MTD.1/MP_INI_ENA
FMT_MTD.1/INI_DIS	FMT_MTD.1/MP_INI_DIS
FMT_MTD.1/KEY_READ	FMT_MTD.1/MP_KEY_READ FMT_MTD.1/PACE_KEY_READ
FMT_MTD.1/PA	FMT_MTD.1/PA
FPT_EMS.1	FPT_EMS.1/Global FPT_EMS.1/MP FPT_EMS.1/PACE
FPT_FLS.1	FPT_FLS.1/Global
FPT_TST.1	FPT_TST.1/Global FPT_TST.1/PACE FPT_TST.1/CA
FPT_PHP.3	FPT_PHP.3.1/Global

Table 14: PPs SFR

4.2.2. Overview of the SFR defined in this ST

Notation:
For optimisation and ease read, all the SFR presented in chapter Security Functional Requirements have extensions as presented here:
SFR (**/Global)** that are global to the product (shared between the various TOE)
SFR (/**MP**) that are dedicated for the Personalization phases
SFR (/**AA**) that are dedicated for Active Authentication
SFR (/**PACE**) that are dedicated for Password Authenticated Connection Establishment
SFR (/**PACE_CAM**) that are dedicated for Password Authenticated Connection Establishment with Chip Authentication Mapping

4.2.3. Complete overview of the SFR

From the PP, the following table lists the SFR defined in the ST with the generic notation.

SFR from the PP
FCS_CKM.1/DH_PACE ; FCS_CKM.4; FCS_COP.1/PACE_ENC ; FCS_COP.1/PACE_MAC; FCS_RND.1; FIA_AFL.1/PACE; FIA_UID.1/PACE ; FIA_UAU.1/PACE ; FIA_UAU.4/PACE ; FIA_UAU.5/PACE ; FIA_UAU.6/PACE ; FDP_ACC.1/TRM ; FDP_ACF.1/TRM ; FDP_RIP.1 ; FDP_UCT.1/TRM; FDP_UIT.1/TRM ; FAU_SAS.1 ; FMT_SMF.1 ; FMT_SMR.1/PACE ; FMT_LIM.1 ; FMT_LIM.2 ; FMT_MTD.1/INI_ENA ; FMT_MTD.1/INI_DIS ; FMT_MTD.1/KEY_READ ; FMT_MTD.1/PA ; FPT_EMS.1 ; FPT_FLS.1 ; FPT_TST.1 ; FPT_PHP.3

Table 15: SFR from the PP

The following table presents the additional SFRs and express its functionality.

Section	Additional SFR
MP	FCS_CKM.1/MP ; FCS_COP.1/MP ; FDP_ACC.2/MP ; FDP_ACF.1/MP ; FDP_ITC.1/MP ; FDP_UCT.1/MP ; FDP_UIT.1/MP ; FIA_AFL.1/MP ; FIA_UAU.1/MP ; FIA_UID.1/MP ; FIA_UAU.4/MP ; FIA_UAU.5/MP ; FMT_MTD.1/MP ; FTP_ITC.1/MP ; FMT_MTD.1/MP_KEY_READ ; FMT_MTD.1/MP_KEY_WRITE
Active Authentication	FCS_COP.1/AA ; FDP_DAU.1/AA ; FDP_ITC.1/AA ; FMT_MTD.1/AA_KEY_READ ; FMT_MOF.1/AA ; FMT_MTD.1/AA_KEY_WRITE
Chip Authentication	FIA_API.1/CA ; FSC_CKM.1/CA ; FCS_COP.1/CA ; FIA_UAU.1/CA ; FIA_UAU.5/CA ; FIA_UAU.6/CA ; FIA_UID.1/CA ; FPT_TST.1/CA ; FMT_MTD.1/CA_KEY_WRITE ; FMT_MTD.1/CA_KEY_READ ; FDP_UCT.1/CA ; FDP_UIT.1/CA
PACE_CAM	FIA_UAU.1/PACE_CAM; FIA_UAU.4/PACE_CAM; FIA_UAU.5/PACE_CAM; FIA_UAU.6/PACE_CAM; FIA_UID.1/PACE_CAM; FMT_MTD.1/CA_KEY_WRITE

Table 16: Additional SFR

The following table presents Global SFR overview:

Global SFR	Additional?	ST generic notation
FCS_CKM.4/Global	No	FCS_CKM.4
FCS_RND.1/Global	No	FCS_RND.1
FMT_LIM.1/Global	No	FMT_LIM.1
FMT_LIM.2/Global	No	FMT_LIM.2
FPT_EMS.1/Global	No	FPT_EMS.1
FPT_FLS.1/Global	No	FPT_FLS.1
FPT_TST.1/Global	No	FPT_TST.1
FPT_PHP.3/Global	No	FPT_PHP.3

Table 17: Global SFR overview

MP SFR	Additional?	ST generic notation
FCS_CKM.1/MP	Yes	FCS_CKM.1/MP
FCS_COP.1/MP_ENC_3DES FCS_COP.1/MP_ENC_AES FCS_COP.1/MP_MAC_3DES FCS_COP.1/MP_MAC_AES FCS_COP.1/MP_AUTH_3DES FCS_COP.1/MP_AUTH_AES FCS_COP.1/MP_SHA	Yes	FCS_COP.1/MP
FDP_ACC.2/MP	Yes	FDP_ACC.2/MP
FDP_ACF.1/MP	Yes	FDP_ACF.1/MP
FDP_ITC.1/MP	Yes	FDP_ITC.1/MP
FDP_UCT.1/MP	Yes	FDP_UCT.1/MP
FDP_UIT.1/MP	Yes	FDP_UIT.1/MP

FIA_AFL.1/MP	Yes	FIA_AFL.1/MP
FIA_UAU.1/MP	Yes	FIA_UAU.1/MP
FIA_UID.1/MP	Yes	FIA_UID.1/MP
FIA_UAU.4/MP_3DES FIA_UAU.4/MP_AES	Yes	FIA_UAU.4/MP
FIA_UAU.5/MP_3DES FIA_UAU.5/MP_AES	Yes	FIA_UAU.5/MP
FMT_MTD.1/MP	Yes	FMT_MTD.1/MP
FTP_ITC.1/MP	Yes	FTP_ITC.1/MP
FMT_MTD.1/MP_INI_ENA	No	FMT_MTD.1/INI_ENA
FMT_MTD.1/MP_INI_DIS	No	FMT_MTD.1/INI_DIS
FMT_MTD.1/MP_KEY_READ	Yes	FMT_MTD.1/MP_KEY_READ
FMT_MTD.1/MP_KEY_WRITE	Yes	FMT_MTD.1/MP_KEY_WRITE
FAU_SAS.1/MP	No	FAU_SAS.1
FMT_SMF.1/MP	No	FMT_SMF.1
FMT_SMR.1/MP	No	FMT_SMR.1/PACE
FPT_EMS.1/MP	No	FPT_EMS.1

Table 18: MP SFR overview

The following table presents the dedicated SFRs for Active Authentication (AA)

Active Auth. SFR	AdditionalSFR?	ST generic notation
FCS_COP.1/AA_DSA FCS_COP.1/AA_ECDSA	Yes	FCS_COP.1/AA
FDP_DAU.1/AA	Yes	FDP_DAU.1/AA
FDP_ITC.1/AA	Yes	FDP_ITC.1/AA
FMT_MTD.1/AA_KEY_READ	Yes	FMT_MTD.1/AA_KEY_READ
FPT_EMS.1/AA	No	FPT_EMS.1
FMT_MOF.1/AA	Yes	FMT_MOF.1/AA
FMT_MTD.1/AA_KEY_WRITE	Yes	FMT_MTD.1/AA_KEY_WRITE

Table 19: Additional SFR for the Active Authentication

CA SFR overview:

CA SFR	Additional?	ST generic notation
FIA_API.1/CA	Yes	FIA_API.1/CA
FCS_CKM.1/CA_DH_SM_3DES FCS_CKM.1/CA_ECDH_SM_3DES FCS_CKM.1/CA_DH_SM_AES FCS_CKM.1/CA_ECDH_SM_AES	Yes	FCS_CKM.1/CA
FCS_COP.1/CA_SHA_SM_3DES FCS_COP.1/CA_SYM_SM_3DES FCS_COP.1/CA_MAC_SM_3DES FCS_COP.1/CA_SHA_SM_AES FCS_COP.1/CA_SYM_SM_AES FCS_COP.1/CA_MAC_SM_AES	Yes	FCS_COP.1/CA
FDP_ITC.1/CA	Yes	FDP_ITC.1/CA
FIA_UAU.1/CA	Yes	FIA_UAU.1/CA
FIA_UAU.5/CA_3DES FIA_UAU.5/CA_AES	Yes	FIA_UAU.5/CA
FIA_UAU.6/CA	Yes	FIA_UAU.6/CA
FIA_UID.1/CA	Yes	FIA_UID.1/CA
FPT_EMS.1/CA	No	FPT_EMS.1
FPT_TST.1/CA	Yes	FPT_TST.1/CA
FMT_MTD.1/CA_KEY_WRITE	Yes	FMT_MTD.1/CA_KEY_WRITE
FMT_MTD.1/CA_KEY_READ	Yes	FMT_MTD.1/CA_KEY_READ
FDP_UCT.1/CA	Yes	FDP_UCT.1/CA
FDP_UIT.1/CA	Yes	FDP_UIT.1/CA

Table 20: CA SFR overview

PACE SFR overview:

PACE SFR	Additional?	ST generic notation
FCS_CKM.1/DH_PACE_AES FCS_CKM.1/DH_PACE_3DES FCS_CKM.1/ECDH_PACE_AES FCS_CKM.1/ECDH_PACE_AES	No	FCS_CKM.1/DH_PACE
FCS_COP.1/PACE_ENC_AES FCS_COP.1/PACE_ENC_3DES	No	FCS_COP.1/PACE_ENC
FCS_COP.1/PACE_MAC_AES FCS_COP.1/PACE_MAC_3DES	No	FCS_COP.1/PACE_MAC
FDP_ACC.1/TRM	No	FDP_ACC.1/TRM
FDP_ACF.1/PACE_EAC	No	FDP_ACF.1/TRM
FDP_RIP.1	No	FDP_RIP.1
FDP_UCT.1/TRM	No	FDP_UCT.1/TRM
FDP_UIT.1/TRM	No	FDP_UIT.1/TRM
FIA_AFL.1/PACE	No	FIA_AFL.1/PACE
FIA_UAU.1/PACE	No	FIA_UAU.1/PACE
FIA_UAU.4/PACE	No	FIA_UAU.4/PACE
FIA_UAU.5/PACE	No	FIA_UAU.5/PACE
FIA_UAU.6/PACE	No	FIA_UAU.6/PACE
FIA_UID.1/PACE	No	FIA_UID.1/PACE
FMT_MTD.1/PACE_KEY_READ	No	FMT_MTD.1/ KEY_READ
FMT_SMR.1/PACE	No	FMT_SMR.1/PACE
FPT_EMS.1/PACE	No	FPT_EMS.1
FTP_ITC.1/PACE	No	FTP_ITC.1/PACE
FPT_TST.1/PACE	No	FPT_TST.1/PACE
FMT_MTD.1/PA	No	FMT_MTD.1/PA

Table 21: PACE SFR overview

4.2.4. Overview of the additional protocols

4.2.4.1. Chip Authentication

The Chip Authentication has been added to this Security Target in order to reinforce the BAC authentication mechanism by ensuring the verification of the Card by the Terminal. For this addition, the TOE SPD has been refined and contains the following additions:

- Additional Threats: **§ 5.3.2**
- Additional Objective: **§ 6.1.2**
- Additional OSP: **§ 5.4.2**
- Additional Assumptions: **§ 5.5.2**

4.2.4.2. Active Authentication

The additional functionality of Active Authentication (AA) is based on the ICAO PKI V1.1 and the related on-card generation of RSA and ECC keys.
It implies the following addition to the standard PP:

- Additional Threats: **§ 5.3.3**
- Additional Objective: **§ 6.1.3**
- Additional OSP: **§ 5.4.3**
- Additional Assumptions: **§ 5.5.3**

4.2.4.3. Prepersonalization phase

The prepersonalization phase has been reinforced in this Security Target, with the following elements. This functionality is usable in phase 5 and phase 6. Once the product is locked, stated as personalized, it is no more possible to perform this operation.

4.2.5. Rationale for the additions

In order to be compliant with the CEM, a rationale is given for the additional Objectives on the Environment, such as to demonstrate that they neither mitigates a threat or fulfil an OSP.

4.2.5.1. OE for CA rationale

OE.Exam_MRTD_CA, **OE.Prot_Logical_MRTD_CA** and **OE.Auth_Key_MRTD** define additional requirements on the operational environment for the Chip Authentication Protocol which is not in the original scope of the PP BAC. This OE is only linked to threat and OSP for the Chip Authentication and has no links with those of the PP.

4.2.5.2. OE for AA rationale

The objectives **OE.Exam_MRTD_AA, OE.Prot_Logical_MRTD_AA, OE.Activ_Auth_Verif** and **OE.Activ_Auth_Sign** define additional requirements on the operational environment for the Active Authentication Protocol which is not in the original scope of the PP BAC. This OE is only linked to threat and OSP for the Active Authentication and has no links with those of the PP.

4.2.5.3. Assumption for AA rationale

The **A.Insp_Sys_AA is added, this assumption is only linked to Active Authentication mechanism as the** Inspection System **has to implement** the mechanism and shall verify the authenticity of the MRTD's chip during inspection using the signature returned by the TOE during Active Authentication.

4.2.5.4. Assumption for CA rationale

The A.Insp_Sys_CA,
The assumption A.Insp_Sys_CA serves **only** the Chip authentication mechanism added in the scope of the evaluation. The inspection system **shall implement the CA mechanism**. The IS has to verify the authenticity of the MRTD during the inspection by establishing a secure messaging.

A.Signature_PKI
This assumption is **only** linked to the Chip authentication as the issuing and receiving States or Organizations **shall establish a public key infrastructure for passive authentication i.e. digital signature** creation and verification for the logical MRTD.

4.3. Non evaluated features

Some features may be part of the TOE but are not evaluated as they are not relevant for the TSFs:

- BAC
- EAC

5. SECURITY PROBLEM DEFINITION

5.1. Subjects

SFR	Before phase 5	Phase 5	Phase 6	Phase 7
PP BAC subjects				
Manufacturer	x	x		
Personalization Agent			x	
Terminal		x	x	x
Inspection System				x
MRTD Holder				x
Traveler				x
Attacker	x	x	x	x
Additional subjects				
IC Developer	x			
Software Developer	x			
Prepersonalizer (refinement of Manufacturer. It corresponds to the MRTD manufacturer)		x		

Table 22: Subjects and phases

5.1.1. PP PACE

Manufacturer
Generic term for the IC Manufacturer producing integrated circuit and the travel document Manufacturer completing the IC to the travel document. The Manufacturer is the default user of the TOE during the manufacturing life cycle phase. The TOE itself does not distinguish between the IC Manufacturer and travel document Manufacturer using this role Manufacturer.
This entity is commensurate with 'Manufacturer' in [47].

Personalisation Agent
An organisation acting on behalf of the travel document Issuer to personalise the travel document for the travel document holder by some or all of the following activities:

- Establishing the identity of the travel document holder for the biographic data in the travel document
- Enrolling the biometric reference data of the travel document holder
- Writing a subset of these data on the physical travel document (optical personalisation) and storing them in the travel document (electronic personalisation) for the travel document holder as defined in [43]
- Writing the document details data
- Writing the initial TSF data
- Signing the Document Security Object defined in [43] (in the role of DS).

Please note that the role 'Personalisation Agent' may be distributed among several institutions according to the operational policy of the travel document Issuer.
This entity is commensurate with 'Personalisation agent' in [47].

Application Note
Personalization Agent is refered as the Personalizer in the Security Target

Terminal
A terminal is any technical system communicating with the TOE through the contactless/contact interface. The role 'Terminal' is the default role for any terminal being recognised by the TOE as not being PACE authenticated ('Terminal' is used by the travel document presenter). This entity is commensurate with 'Terminal' in [47].

Basic Inspection System with PACE (BIS-PACE)
A technical system being used by an inspecting authority and verifying the travel document presenteras the travel documentholder (for ePassport: by comparing the real biometric data (face) of the travel document presenter with the stored biometric data (DG2) of the travel document holder).
BIS-PACE implements the terminal's part of the PACE protocol and authenticates itself to the travel document using a shared password (PACE password) and supports Passive Authentication.

Document Signer (DS)
An organisation enforcing the policy of the CSCA and signing the Document Security Object stored on the travel document for passive authentication. A Document Signer is authorised by the national CSCA issuing the Document Signer Certificate (CDS), see [43]. This role is usually delegated to a Personalisation Agent.

Country Signing Certification Authority (CSCA)
An organisation enforcing the policy of the travel document Issuer with respect to confirming correctness of user and TSF data stored in the travel document. The CSCA represents the country specific root of the PKI for the travel document and creates the Document Signer Certificates within this PKI.
The CSCA also issues the self-signed CSCA Certificate (C_{CSCA}) having to be distributed by strictly secure diplomatic means, see [43].

Travel document holder (MRTD holder)
A person for whom the travel document Issuer has personalised the travel document. This entity is commensurate with 'MRTD Holder' in [47]. Please note that a travel document holder can also be an attacker.

Travel document presenter (Traveler)
A person presenting the travel document to a terminal and claiming the identity of the travel document holder. This external entity is commensurate with 'Traveller' in [47]. Please note that a travel document presenter can also be an attacker (s. below).

Attacker
A threat agent (a person or a process acting on his behalf) trying to undermine the security policy defined by the current PP, especially to change properties of the assets having to be maintained. The attacker is assumed to possess an at most high attack potential.
Please note that the attacker might 'capture' any subject role recognised by the TOE.
This external entity is commensurate with 'Attacker' in [47].

5.1.2. Additional Subjects

IC Developer
Developer of the IC.

TOE Developer
Developer of part of the TOE source code.

Prepersonalizer
Agent in charge of the Prepersonalization. This agent corresponds to the MRTD manufacturer as described in [47].

5.2. Assets

5.2.1. User data

The assets to be protected by the TOE include the User Data on the travel document's chip, user data transferred between the TOE and the terminal, and travel document tracing data from the claimed PACE PP [50], chap 3.1.

Logical travel document sensitive User Data
Sensitive biometric reference data (EF.DG3, EF.DG4)

Authenticity of the travel document's chip
The authenticity of the travel document's chip personalised by the issuing State or Organisation for the travel document holder is used by the traveller to prove his possession of a genuine travel document.

Due to strict conformance to PACE PP, this ST also includes all assets listed in [50], chap 3.1, namely the primary assets user data stored on the TOE (object 1), user data transferred between the TOE and the terminal connected (object 2), travel document tracing data (object 3), and the secondary assets accessibility to the TOE functions and data only for authorised subjects (object 4) Genuineness of the TOE (object 5), TOE intrinsic secret cryptographic keys (object 6), TOE intrinsic non secret cryptographic material (object 7), and travel document communication establishment authorisation data (object 8).
They are refined here below for the present TOE.

User data stored on the TOE
All data (being not authentication data) stored in the context of the eMRTD application of the travel document as defined in **[43]** and being allowed to be read out solely by an authenticated terminal acting as Basic Inspection System with PACE (in the sense of **[43]**), i.e. for the current TOE:

User Data	Description
CPLC Data	Data uniquely identifying the chip. They are considered as user data as they enable to track the holder
Sensitive biometric reference data (EF.DG3, EF.DG4)	Contain the fingerprint and the iris picture
Chip Authentication Public Key and attributes in EF.DG14	Contain public data enabling to authenticate the chip thanks to a chip authentication
Active Authentication Public Key and attributes in EF.DG15	Contain public data enabling to authenticate the chip thanks to an active authentication

Table 23: User data stored on the TOE

Property to be maintained by the current security policy: Confidentiality, Integrity and Authenticity.

Though not each data element stored on the TOE represents a secret, the specification [4] anyway requires securing their confidentiality: only terminals authenticated according to [4] can get access to the user data stored. They have to be operated according to P.Terminal.

User data transferred between the TOE and the terminal connected
All data (being not authentication data) being transferred in the context of the eMRTD application of the travel document as defined in **[47]** between the TOE and an authenticated terminal acting as Basic Inspection System with PACE (in the sense of **[43]**).
User data can be received and sent (exchange <--> [receive, send]).
Property to be maintained by the current security policy: Confidentiality, Integrity and Authenticity.

Though not each data element being transferred represents a secret, the specification [4] anyway requires securing their confidentiality: the secure messaging in encrypt-then-authenticate mode is required for all messages according to [4].

Travel document tracing data
Technical information about the current and previous locations of the travel document gathered unnoticeable by the travel document holder recognising the TOE not knowing any PACE password. TOE tracing data can be provided / gathered.
Property to be maintained by the current security policy: Unavailability

Unavailability represents a prerequisite for anonymity of the travel document holder

5.2.2. TSF data

Accessibility to the TOE functions and data only for authorised subjects
Property of the TOE to restrict access to TSF and TSF-data stored in the TOE to authorised subjects only.

TSF data	Description
Personalisation Agent reference authentication Data	Private key enabling to authenticate the Personalisation agent (same as PACE ST)
Password Authenticated Connection Establishment (PACE) Key	Master keys used to established a trusted channel between the Basic Inspection Terminal and the travel document (same as PACE ST)
Session keys for the secure channel	Session keys used to protect the communication in confidentiality and in integrity

Table 24: Accessibility to the TOE functions and data only for authorised subjects

Property to be maintained by the current security policy: Availability.

Genuineness of the TOE
Property of the TOE is to be authentic in order to provide claimed security functionality in a proper way. The authenticity of the MRTD's chip personalised by the issuing State or Organization for the MRTD holder is used by the traveller to prove his possession of a genuine MRTD. This asset also covers "Authenticity of the MRTD's chip" in **[47].**

TSF data	Description
Chip Authentication private Key	Private key the chip uses to perform a chip authentication
Active Authentication private key	Private key the chip uses to perform an active authentication
Current Date	Current date of the travel document

Table 25: Genuineness of the TOE

Property to be maintained by the current security policy: Availability.

TOE internal secret cryptographic keys
Permanently or temporarily stored secret cryptographic material used by the TOE in order to enforce its security functionality.

TSF data	Description
Personalisation Agent reference authentication Data	Private key enabling to authenticate the Personalisation agent
Password Authenticated Connection Establishment (PACE) Key	Master keys used to established a trusted channel between the Basic Inspection Terminal and the travel document
Chip Authentication private Key	Private key the chip uses to perform a chip authentication
Active Authentication private key	Private key the chip uses to perform an active authentication
Session keys for the secure channel	Session keys used to protect the communication in confidentiality and in integrity
MSK	Manufacturer Secret Key used to perform the authentication of the personal agent in pre-personalisation phase

Table 26: TOE internal secret cryptographic keys

Property to be maintained by the current security policy: Confidentiality, Integrity.

TOE internal non-secret cryptographic material
Permanently or temporarily stored non-secret cryptographic (public) keys and other non-secret material (Document Security Object SOD containing digital signature) used by the TOE in order to enforce its security functionality.

TSF data	Description
Life Cycle State	Life Cycle state of the TOE
Public Key CVCA	Trust point of the travel document stored in persistent memory
CVCA Certificate	All the data related to the CVCA key (expiration date, name,..) stored in persistent memory
Current Date	Current date of the travel document

Table 27: TOE internal non-secret cryptographic material

Property to be maintained by the current security policy: Integrity, Authenticity.

Travel Document communication establishment authorisation data
Restricted-revealable authorization information for a human user being used for verification of the authorisation attempts as authorised user (PACE password). These data are stored in the TOE and are not to be send to it.

TSF data	Description
PACE password (MRZ or CAN)	Reference information being persistently stored in the TOE and allowing PACE authentication

Table 28: Travel Document communication establishment authorisation data

Property to be maintained by the current security policy: Confidentiality, Integrity.

5.3. Threats

This section describes the threats to be averted by the TOE independently or in collaboration with its IT environment. These threats result from the TOE method of use in the operational environment and the assets stored in or protected by the TOE.

5.3.1. PP PACE

T.Skimming

Adverse action
An attacker imitates an inspection system in order to get access to the user data stored on or transferred between the TOE and the inspecting authority connected via the contactless/contact interface of the TOE.

Threat agent
Having high attack potential, cannot read and does not know the correct value of the shared password (PACE password) in advance.

Asset
Confidentiality of logical travel document data

T.Eavesdropping

Adverse action
An attacker is listening to the communication between the travel document and the PACE authenticated BIS-PACE in order to gain the user data transferred between the TOE and the terminal connected.

Threat agent

Having high attack potential, cannot read and does not know the correct value of the shared password (PACE password) in advance.

Asset
Confidentiality of logical travel document data

T.Tracing
Adverse action
An attacker tries to gather TOE tracing data (i.e. to trace the movement of the travel document) unambiguously identifying it remotely by establishing or listening to a communication via the contactless/contact interface of the TOE.
Threat agent
Having high attack potential, cannot read and does not know the correct value of the shared password (PACE password) in advance.
Asset
Privacy of the travel document holder

T.Forgery
Adverse action
An attacker fraudulently alters the *User Data* or/and *TSF-data stored on the travel document* or/and *exchanged between the TOE and the terminal connected* in order to outsmart the PACE authenticated BIS-PACE by means of changed travel document holder’s related reference data (like biographic or biometric data). The attacker does it in such a way that the terminal connected perceives these modified data as authentic one.
Threat agent
having high attack potential.
Asset
integrity of the travel document.

T.Abuse-Func
Adverse action
An attacker may use functions of the TOE which shall not be used in TOE operational phase in order (i) to manipulate or to disclose the User Data stored in the TOE, (ii) to manipulate or to disclose the TSF-data stored in the TOE or (iii) to manipulate (bypass, deactivate or modify) soft-coded security functionality of the TOE. This threat addresses the misuse of the functions for the initialisation and personalisation in the operational phase after delivery to the travel document holder.
Threat agent
having high attack potential, being in possession of one or more legitimate travel documents
Asset
integrity and authenticity of the travel document, availability of the functionality of the travel document.

T.Information_Leakage
Adverse action
An attacker may exploit information leaking from the TOE during its usage in order to disclose confidential *User Data* or/and *TSF-data stored on the travel document* or/and *exchanged between the TOE and the terminal connected*. The information leakage may be inherent in the normal operation or caused by the attacker.
Threat agent
having high attack potential.
Asset
confidentiality of User Data and TSF-data of the travel document.

Application note: Leakage may occur through emanations, variations in power consumption, I/O characteristics, clock frequency, or by changes in processing time requirements. This leakage may be interpreted as a covert channel transmission, but is more closely related to measurement of operating parameters which may be derived either from measurements of the contactless interface (emanation) or direct measurements (by contact to the chip still available even for a contactless chip) and can then be related to the specific operation being performed. Examples are Differential Electromagnetic Analysis (DEMA) and Differential Power Analysis (DPA). Moreover the attacker may try actively to enforce information leakage by fault injection (e.g. Differential Fault Analysis)..

T.Phys-Tamper
Adverse action
An attacker may perform physical probing of the travel document in order (i) to disclose the TSF-data, or (ii) to disclose/reconstruct the TOE's Embedded Software. An attacker may physically modify the travel document in order to alter (I) its security functionality (hardware and software part, as well), (ii) the User Data or the TSF-data stored on the travel document.
Threat agent
having high attack potential, being in possession of one or more legitimate travel documents.
Asset
integrity and authenticity of the travel document, availability of the functionality of the travel document, confidentiality of User Data and TSF-data of the travel document.

Application note: Physical tampering may be focused directly on the disclosure or manipulation of the user data (e.g. authentication key of the travel document) or indirectly by preparation of the TOE to following attack methods by modification of security features (e.g. to enable information leakage through power analysis). Physical tampering requires a direct interaction with the travel document's internals. Techniques commonly employed in IC failure analysis and IC reverse engineering efforts may be used. Before that, hardware security mechanisms and layout characteristics need to be identified. Determination of software design including treatment of the user data and the TSF data may also be a pre-requisite. The modification may result in the deactivation of a security function, the biometric reference data for the inspection system) or the TSF data (e.g.

T.Malfunction
Adverse action
An attacker may cause a malfunction the travel document's hardware and Embedded Software by applying environmental stress in order to (i) deactivate or modify security features or functionality of the TOE' hardware or to (ii) circumvent, deactivate or modify security functions of the TOE's Embedded Software. This may be achieved e.g. by operating the travel document outside the normal operating conditions, exploiting errors in the travel document's Embedded Software or misusing administrative functions. To exploit these vulnerabilities an attacker needs information about the functional operation.
Threat agent
having high attack potential, being in possession of one or more legitimate travel documents, having information about the functional operation.
Asset
integrity and authenticity of the travel document, availability of the functionality of the travel document, confidentiality of User Data and TSF-data of the travel document.

Application note: A malfunction of the TOE may also be caused using a direct interaction with elements on the chip surface. This is considered as being a manipulation (refer to the threat T.PhysTamper) assuming a detailed knowledge about TOE's internals.

5.3.2. CA

T.Counterfeit
Adverse action:
An attacker with high attack potential produces an unauthorized copy or reproduction of a genuine MRTD's chip to be used as part of a counterfeit MRTD. This violates the authenticity of the MRTD's chip used for authentication of a traveller by possession of a MRTD. The attacker may generate a new data set or extract completely or partially the data from a genuine MRTD's chip and copy them on another appropriate chip to imitate this genuine MRTD's chip.
Threat agent:
having high attack potential, being in possession of one or more legitimate MRTDs
Asset:
authenticity of logical MRTD data

5.3.3. AA

T.Counterfeit
The definition is in the previous chapter.

5.4. Organisational Security Policies

The TOE shall comply with the following Organisational Security Policies (OSP) as security rules, procedures, practices, or guidelines imposed by an organisation upon its operations.

5.4.1. PP PACE

P.Manufact

The Initialization Data are written by the IC Manufacturer to identify the IC uniquely. The MRTD Manufacturer writes the Pre-personalization Data which contains at least the Personalization Agent Key.

P.Pre-Operational

1) The travel document Issuer issues the travel document and approves it using the terminals complying with all applicable laws and regulations.

2) The travel document Issuer guarantees correctness of the user data (amongst other of those, concerning the travel document holder) and of the TSF-data permanently stored in the TOE.

3) The travel document Issuer uses only such TOE's technical components (IC) which enable traceability of the travel documents in their manufacturing and issuing life cycle phases, i.e. before they are in the operational phase.

4) If the travel document Issuer authorises a Personalisation Agent to personalise the travel document for travel document holders, the travel document Issuer has to ensure that the Personalisation Agent acts in accordance with the travel document Issuer's policy.

P.Card_PKI

1) The travel document Issuer shall establish a public key infrastructure for the passive authentication, i.e. for digital signature creation and verification for the travel document. For this aim, he runs a Country Signing Certification Authority (CSCA). The travel document Issuer shall publish the CSCA Certificate (CCSCA)

2) The CSCA shall securely generate, store and use the CSCA key pair. The CSCA shall keep the CSCA Private Key secret and issue a self-signed CSCA Certificate (CCSCA) having to be made available to the travel document Issuer by strictly secure means, see [53]. The CSCA shall create the Document Signer Certificates for the Document Signer Public Keys (CDS) and make them available to the travel document Issue.

3) A Document Signer shall:
(i) Generate the Document Signer Key Pair
(ii) Hand over the Document Signer Public Key to the CSCA for certification
(iii) Keep the Document Signer Private Key secret
(iv) Securely use the Document Signer Private Key for signing the Document Security Objects of travel documents.

P.Trustworthy_PKI

The CSCA shall ensure that it issues its certificates exclusively to the rightful organisations (DS) and DSs shall ensure that they sign exclusively correct Document Security Objects to be stored on the travel document.

P.Terminal

The Basic Inspection Systems with PACE (BIS-PACE) shall operate their terminals as follows:

1) The related terminals shall be used by terminal operators and by travel document holders

2) They shall implement the terminal parts of the PACE protocol [53], of the Passive Authentication [43] and use them in this order. The PACE terminal shall use randomly and (almost) uniformly selected nonces, if required by the protocols (for generating ephemeral keys for Diffie-Hellmann)

3) The related terminals need not to use any own credentials

4) They shall also store the Country Signing Public Key and the Document Signer Public Key (in form of C_{CSCA} and C_{DS}) in order to enable and to perform Passive Authentication (determination of the authenticity of data groups stored in the travel document, [43])

5) The related terminals and their environment shall ensure confidentiality and integrity of respective data handled by them (e.g. confidentiality of PACE passwords, integrity of PKI certificates, etc.), where it is necessary for a secure operation of the TOE

5.4.2. CA

P.Chip_Auth
The terminal implements the Chip Authentication protocol as described in [43].

5.4.3. AA

P.Activ_Auth

The terminal implements the Active Authentication protocol as described in [43].

5.5. Assumptions

The assumptions describe the security aspects of the environment in which the TOE will be used or is intended to be used.

5.5.1. PP PACE

A.Passive_Auth
The issuing and receiving States or Organisations establish a public key infrastructure for passive authentication i.e. digital signature creation and verification for the logical travel document. The issuing State or Organisation runs a Certification Authority (CA) which securely generates, stores and uses the Country Signing CA Key pair. The CA keeps the Country Signing CA Private Key secret and is recommended to distribute the Country Signing CA Public Key to ICAO, all receiving States maintaining its integrity.
The Document Signer

- Generates the Document Signer Key Pair
- Hands over the Document Signer Public Key to the CA for certification
- Keeps the Document Signer Private Key secret
- Uses securely the Document Signer Private Key for signing the Document Security Objects of the travel documents.

The CA creates the Document Signer Certificates for the Document Signer Public Keys that are distributed to the receiving States and Organisations. It is assumed that the Personalisation Agent ensures that the Document Security Object contains only the hash values of genuine user data according to [43].

5.5.2. Assumptions for Chip Authentication

A.Insp_Sys_CA
The Inspection System implements the Chip Authentication Mechanism. The Inspection System verifies the authenticity of the MRTD’s chip during inspection and establishes secure messaging with keys established by the Chip Authentication Mechanism.

A.Signature_PKI
The issuing and receiving States or Organizations establish a public key infrastructure for passive authentication i.e. digital signature creation and verification for the logical MRTD. The issuing State or Organization runs a Certification Authority (CA) which securely generates, stores and uses the Country Signing CA Key pair. The CA keeps the Country Signing CA Private Key secret and is recommended to distribute the Country Signing CA Public Key to ICAO, all receiving States maintaining its integrity. The Document Signer (i) generates the Document Signer Key Pair, (ii) hands over the Document Signer Public Key to the CA for certification, (iii) keeps the Document Signer Private Key secret and (iv) uses securely the Document Signer Private Key for signing the Document Security Objects of the MRTDs. The CA creates the Document Signer Certificates for the Document Signer Public Keys that are distributed to the receiving States and Organizations.

5.5.3. Assumptions for Active Authentication

A.Insp_Sys_AA
The Inspection System implements the Active Authentication Mechanism. The Inspection System verifies the authenticity of the MRTD’s chip during inspection using the signature returned by the TOE during Active Authentication.

6. SECURITY OBJECTIVES

This chapter describes the security objectives for the TOE and the security objectives for the TOE environment. The security objectives for the TOE environment are separated into security objectives for the development and production environment and security objectives for the operational environment.

6.1. Security Objectives for the TOE

This section describes the security objectives for the TOE addressing the aspects of identified threats to be countered by the TOE and organizational security policies to be met by the TOE.

6.1.1. SO from PP PACE

OT.Data_Int
The TOE must ensure integrity of the User Data and the TSF-data stored on it by protecting these data against unauthorised modification (physical manipulation and unauthorised modifying).The TOE must ensure integrity of the User Data and the TSF-data during their exchange between the TOE and the terminal connected (and represented by PACE authenticated BIS-PACE) after the PACE Authentication.

OT.Data_Auth (OT.Data_Authenticity)
The TOE must ensure authenticity of the User Data and the TSF-data stored on it by enabling verification of their authenticity at the terminal-side. The TOE must ensure authenticity of the User Data and the TSF-data during their exchange between the TOE and the terminal connected (and represented by PACE authenticated BIS-PACE) after the PACE Authentication. It shall happen by enabling such a verification at the terminal-side (at receiving by the terminal) and by an active verification by the TOE itself (at receiving by the TOE).

OT.Data_Conf (OT.Data_Confidentiality)

The TOE must ensure confidentiality of the User Data and the TSF-data by granting read access only to the PACE authenticated BIS-PACE connected. The TOE must ensure confidentiality of the User Data and the TSF-data during their exchange between the TOE and the terminal connected after the PACE Authentication.

OT.Tracing
The TOE must prevent gathering TOE tracing data by means of unambiguous identifying the travel document remotely through establishing or listening to a communication via the contactless/contact interface of the TOE without knowledge of the correct values of shared passwords (PACE passwords) in advance.

OT.Prot_Abuse-Func
After delivery of the TOE to the MRTD Holder, the TOE must prevent the abuse of test and support functions that may be maliciously used to:

- (i) Disclose critical User Data
- (ii) Manipulate critical User Data of the IC Embedded Software
- (iii) Manipulate Soft-coded IC Embedded Software
- (iv) Bypass, deactivate, change or explore security features or functions of the TOE.

Details of the relevant attack scenarios depend, for instance, on the capabilities of the Test Features provided by the IC Dedicated Test Software which are not specified here.

OT.Prot_Inf_Leak
The TOE must provide protection against disclosure of confidential TSF data stored and/or processed in the MRTD's chip:

- By measurement and analysis of the shape and amplitude of signals or the time between events found by measuring signals on the electromagnetic field, power consumption, clock, or I/O lines and
- By forcing a malfunction of the TOE and/or
- By a physical manipulation of the TOE.

OT.Prot_Phys-Tamper

The TOE must provide protection of the confidentiality and integrity of the User Data, the TSF Data, and the MRTD's chip Embedded Software. This includes protection against attacks with enhanced-basic attack potential by means of

- Measuring through galvanic contacts which is direct physical probing on the chips surface except on pads being bonded (using standard tools for measuring voltage and current) or
- Measuring not using galvanic contacts but other types of physical interaction between charges (using tools used in solid-state physics research and IC failure analysis)
- Manipulation of the hardware and its security features, as well as
- Controlled manipulation of memory contents (User Data, TSF Data)

with a prior

- reverse-engineering to understand the design and its properties and functions.

OT.Prot_Malfunction

The TOE must ensure its correct operation. The TOE must prevent its operation outside the normal operating conditions where reliability and secure operation has not been proven or tested. This is to prevent errors. The environmental conditions may include external energy (esp. electromagnetic) fields, voltage (on any contacts), clock frequency, or temperature.

OT.Identification

The TOE must provide means to store IC Identification and Pre-Personalization Data in its nonvolatile memory. The IC Identification Data must provide a unique identification of the IC during Phase 2 "Manufacturing" and Phase 3 "Personalization of the MRTD". The storage of the Pre- Personalization data includes writing of the Personalization Agent Key(s). The storage of the Prepersonalization data includes writing of the Personalization Agent Key(s).

OT.AC_Pers

The TOE must ensure that the logical MRTD data in EF.DG1 to EF.DG16, the Document security object according to LDS [43] and the TSF data can be written by authorized Personalization Agents only. The logical MRTD data in EF.DG1 to EF.DG16 and the TSF data may be written only during and cannot be changed after its personalization. The Document security object can be updated by authorized Personalization Agents if data in the data groups EF.DG 3 to EF.DG16 are added.

Application note:
The OT.AC_Pers implies that the data of the LDS groups written during personalisation for travel document holder (at least EF.DG1 and EF.DG2) can not be changed using write access after personalisation.

6.1.2. SO for CA

OT.CA_Proof

The TOE must support the General Inspection Systems to verify the identity and authenticity of the MRTD’s chip as issued by the identified issuing State or Organization by means of the Chip Authentication. The authenticity proof provided by the MRTD’s chip shall be protected against attacks with high attack potential.

Application note: The objective implies the MRTD’s to have (i) a unique identity as given by the MRTD’s Document Number, (ii) a secret to prove its identity by knowledge i.e. a private authentication key as TSF data. The TOE shall protect this TSF data to prevent their misuse. The terminal shall have the reference data to verify the authentication attempt of MRTD’s chip i.e. a certificate for the Chip Authentication Public Key that matches the Chip Authentication Private Key of the MRTD’s chip. This certificate is provided by (i) the Chip Authentication Public Key (EF.DG14) in the LDS [43] and (ii) the hash value of the Chip Authentication Public Key in the Document Security Object signed by the Document Signer.

OT.Data_Int_CA

The TOE must ensure the integrity of the logical MRTD stored on the MRTD's chip against physical manipulation and unauthorized writing. The TOE must ensure the integrity of the logical MRTD data during their transmission to the General Inspection System after Chip Authentication.

6.1.3. SO for AA

OT.AA_Proof
The TOE must support the Inspection Systems to verify the identity and authenticity of MRTD's chip as issued by the identified issuing State or Organization by means of the Active Authentication as defined in [43]. The authenticity proof through AA provided by MRTD's chip shall be protected against attacks with high attack potential.

OT.Data_Int_AA
The TOE must ensure the integrity of the logical MRTD stored on the MRTD's chip against physical manipulation and unauthorized writing. The TOE must ensure the integrity of the logical MRTD data during their transmission to the General Inspection System after Active Authentication.

6.2. Security objectives for the Operational Environment

6.2.1. PP PACE

OE.Legislative_Compliance
The travel document Issuer must issue the travel document and approve it using the terminals complying with all applicable laws and regulations

OE.Pass_Auth_Sign (OE.Passive_Auth_Sign)
The travel document Issuer has to establish the necessary public key infrastructure as follows: the CSCA acting on behalf and according to the policy of the travel document Issuer must (i) generate a cryptographically secure CSCA Key Pair, (ii) ensure the secrecy of the CSCA Private Key and sign Document Signer Certificates in a secure operational environment, and (iii) publish the Certificate of the CSCA Public Key (CCSCA). Hereby authenticity and integrity of these certificates are being maintained.

A Document Signer acting in accordance with the CSCA policy must:
(i) generate a cryptographically secure Document Signing Key Pair
(ii) ensure the secrecy of the Document Signer Private Key
(iii) hand over the Document Signer Public Key to the CSCA for certification
(iv) sign Document Security Objects of genuine travel documents in a secure operational environment only. The digital signature in the Document Security Object relates to all hash values for each data group in use according to [6].

The Personalisation Agent has to ensure that the Document Security Object contains only the hash values of genuine user data according to [6]. The CSCA must issue its certificates exclusively to the rightful organisations (DS) and DSs must sign exclusively correct DocumentSecurity Objects to be stored on travel document.

OE.Personalization
The travel document Issuer must ensure that the Personalisation Agents acting on his behalf:
(i) establish the correct identity of the travel document holder and create the biographical data for the travel document
(ii) enrol the biometric reference data of the travel document holder
(iii) write a subset of these data on the physical Passport (optical personalisation) and store them in the travel document (electronic personalisation) for the travel document holder as defined in [6]
(iv) write the document details data
(v) write the initial TSF data
(vi) sign the Document Security Object defined in [6](in the role of a DS).

OE.Terminal
The terminal operators must operate their terminals as follows:

1.) The related terminals (basic inspection systems, cf. above) are used by terminal operators and by travel document holders as defined in [6]

2.) The related terminals implement the terminal parts of the PACE protocol [4], of the Passive Authentication [4] (by verification of the signature of the Document Security Object) and use them in this order. The PACE terminal uses randomly and (almost) uniformly selected nonces, if required by the protocols (for generating ephemeral keys for Diffie-Hellmann)
3.) The related terminals need not to use any own credentials
4.) The related terminals securely store the Country Signing Public Key and the Document Signer Public Key (in form of CCSCAand CDS) in order to enable and to perform Passive Authentication of the travel document (determination of the authenticity of data groups stored in the travel document, [6])
5.) The related terminals and their environment must ensure confidentiality and integrity of respective data handled by them (e.g. confidentiality of the PACE passwords, integrity of PKI certificates, etc.), where it is necessary for a secure operation of the TOE according to the current PP

OE.MRTD_Holder (OE.Travel_Document_Holder)
The travel document holder may reveal, if necessary, his or her verification values of the PACE password to an authorized person or device who definitely act according to respective regulations and are trustworthy.

6.2.2. OE for CA

OE.Auth_Key_MRTD
The issuing State or Organization has to establish the necessary public key infrastructure in order to:
- (i) Generate the MRTD's Chip Authentication Key Pair
- (ii) Sign and store the Chip Authentication Public Key in the Chip Authentication Public Key data in EF.DG14
- (iii) Support inspection systems of receiving States or organizations to verify the authenticity of the MRTD's chip used for genuine MRTD by certification of the Chip Authentication Public Key by means of the Document Security Object.

OE.Exam_MRTD_CA
Aditionally to the OE.Exam_MRTD, the inspection systems perform the Chip Authentication protocol to verify the Authenticity of the presented MRTD’s chip.

OE.Prot_Logical_MRTD_CA
Aditionally to the OE.Prot_Logical_MRTD, the inspection system prevents eavesdropping to their communication with the TOE before secure messaging is successfully established based on the Chip Authentication Protocol.

Application note
The Inspection Systems follow the order (i) running the Basic Access Control Protocol, (ii) reading and verifying only those parts of the logical MRTD that are necessary to know for the Chip Authentication Mechanism (i.e. Document Security Object and Chip Authentication Public Key), (iii) running the Chip Authentication Protocol, and (iv) reading and verifying the less-sensitive data of the logical MRTD after Chip Authentication. The supposed sequence has the advantage that the less-sensitive data are protected by secure messaging with cryptographic keys based on the Chip Authentication Protocol which quality is under control of the TOE. The inspection system will prevent additionally eavesdropping to their communication with the TOE before secure messaging is successfully established based on the Chip Authentication Protocol. Note that reading the less sensitive data directly after Basic Access Control Mechanism is allowed and is not assumed as threat in this PP. But the TOE ensures that reading of sensitive data is possible after successful Chip Authentication.

6.2.3. OE for AA

OE.Exam_MRTD_AA
Aditionally to the OE.Exam_MRTD, the inspection systems perform the Active Authentication protocol to verify the Authenticity of the presented MRTD’s chip.

OE.Prot_Logical_MRTD_AA
Aditionally to the OE.Prot_Logical_MRTD, the inspection system prevents eavesdropping to their communication with the TOE before secure messaging is successfully established based on the Active Authentication Protocol.

OE.Activ_Auth_Verif
In addition to the verification by passive authentication, the inspection systems may use the verification by Active Authentication, which offers a stronger guaranty of the authenticity of the MRTD.

OE.Activ_Auth_Sign
The issuing State or Organization has to establish the necessary public key infrastructure in order to (i) generate the MRTD's Active Authentication Key Pair, (ii) ensure the secrecy of the MRTD's Active Authentication Private Key, sign and store the Active Authentication Public Key in the Active Authentication Public Key data in EF.DG15 and (iii) support inspection systems of receiving States or organizations to verify the authenticity of the MRTD's chip used for genuine MRTD by certification of the Active Authentication Public Key by means of the Document Security Object.

7. EXTENDED REQUIREMENTS

7.1. Extended family FAU_SAS - Audit data storage

7.1.1. Extended components FAU_SAS.1

Description: see [47].

FAU_SAS.1 Audit storage

FAU_SAS.1.1 The TSF shall provide [assignment: authorized users] with the capability to store [assignment: list of audit information] in the audit records.

Dependencies: No dependencies.

Rationale: see [47]

7.2. Extended family FCS_RND - Generation of random numbers

7.2.1. Extended component FCS_RND.1

Description: see [47]

FCS_RND.1 Quality metric for random numbers

FCS_RND.1.1 The TSF shall provide a mechanism to generate random numbers that meet [assignment: a defined quality metric].
Dependencies: No dependencies.
Rationale: See [47]

7.3. Extended family FIA_API – Authentication proof of identity

7.3.1. Extended component FIA_API.1

Description: see [48]

FIA_API.1 Quality metric for random numbers

FIA_API.1.1 The TSF shall provide a [assignment: authentication mechanism] to prove the identity of the [assignment: authorized user or role].
Dependencies: No dependencies.
Rationale: See [48]

7.4. Extended family FMT_LIM - Limited capabilities and availability

7.4.1. Extended component FMT_LIM.1

Description: see [47]

FMT_LIM.1 Limited capabilities

FMT_LIM.1.1 The TSF shall be designed in a manner that limits their capabilities so that in conjunction with "Limited availability (FMT_LIM.2)" the following policy is enforced [assignment: Limited capability and availability policy].

Dependencies: (FMT_LIM.2)

Rationale: See [47]

7.4.2. Extended component FMT_LIM.2

Description: See [47]

FMT_LIM.2 Limited availability

FMT_LIM.2.1 The TSF shall be designed in a manner that limits their availability so that in conjunction with "Limited capabilities (FMT_LIM.1)" the following policy is enforced [assignment: Limited capability and availability policy].

Dependencies: (FMT_LIM.1)

Rationale: See [47]

7.5. Extended family FPT_EMS - TOE Emanation

7.5.1. Extended component FPT_EMS.1

Description: see [47]

FPT_EMS.1 TOE Emanation

FPT_EMS.1.1 The TOE shall not emit [assignment: types of emissions] in excess of [assignment: specified limits] enabling access to [assignment: list of types of TSF data] and [assignment: list of types of user data].

FPT_EMS.1.2 The TSF shall ensure [assignment: type of users] are unable to use the following interface [assignment: type of connection] to gain access to [assignment: list of types of TSF data] and [assignment: list of types of user data].

Dependencies: No dependencies.

Rationale: See [47]

8. SECURITY REQUIREMENTS

8.1. Security Functional Requirements

This chapter presents the Security Functional Requirements to take into account within the TOE configuration presented in this security target. It is composed of the following elements:

- **Global SFR** that are applicable to all the passports configuration
- **MP SFR** for covering the phase Manufacturing and Personalization described in the Passport Protection Profile.
- **Active Authentication SFR** that cover the Active Authentication Protocol
- **CA SFR** that cover the Chip Authentication Protocol
- **PACE SFR** that cover the Password Authenticated Connection Establishment protocol
- **PACE CAM** that cover the Password Authenticated Connection Establishment with Chip Authentication Mapping protocol

8.1.1. Global SFR

This chapter covers the common SFR that are shared between the different parts of the embedded application on the product.

FCS_CKM.4/Global Cryptographic key destruction

FCS_CKM.4.1/Global The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method **zeroisation** that meets the following: **none**.

FCS_RND.1/Global Quality metric for random numbers

FCS_RND.1.1/Global The TSF shall provide a mechanism to generate random numbers that meet
1. The requirement to provide an entropy of at least 7.976 bits in each byte, following AIS 31[34] and
2. The requirement of **FIPS SP800-90 [18]**for random number generation.

FMT_LIM.1/Global Limited capabilities

FMT_LIM.1.1/Global The TSF shall be designed in a manner that limits their capabilities so that in conjunction with "Limited availability (FMT_LIM.2)" the following policy is enforced**:**

Deploying Test Features after TOE Delivery does not allow:

1. User Data to be manipulated
2. TSF data to be disclosed or manipulated
3. Software to be reconstructed
4. Substantial information about construction of TSF to be gathered which may enable other attacks

FMT_LIM.2/Global Limited availability

FMT_LIM.2.1/Global The TSF shall be designed in a manner that limits their availability so that in conjunction with "Limited capabilities (FMT_LIM.1)" the following policy is enforced**:**
Deploying Test Features after TOE Delivery does not allow

1. User Data to be manipulated
2. TSF data to be disclosed or manipulated
3. Software to be reconstructed
4. Substantial information about construction of TSF to be gathered which may enable other attacks

FPT_EMS.1/Global TOE Emanation

FPT_EMS.1.1/Global The TOE shall not emit power variations, timing variations during command execution in excess of non useful information enabling access to
1. EF.COM, EF.SOD and EF.DG1 to EF.DG16

FPT_EMS.1.2/Global The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to
1. EF.COM, EF.SOD and EF.DG1 to EF.DG16

FPT_FLS.1/Global Failure with preservation of secure state

FPT_FLS.1.1/Global The TSF shall preserve a secure state when the following types of failures occur:
1. Exposure to out-of-range operating conditions where therefore a malfunction could occur
2. Failure detected by TSF according to FPT_TST.1.

FPT_TST.1/Global TSF testing

FPT_TST.1.1/Global The TSF shall run a suite of self tests to demonstrate the correct operation of **the TSF, at the conditions:**

At reset
Before any cryptographic operation
When accessing a DG or any EF
Prior to any use of TSF data
Before execution of any command

FPT_TST.1.2/Global The TSF shall provide authorised users with the capability to verify the integrity of **TSF data**.

FPT_TST.1.3/Global The TSF shall provide authorised users with the capability to verify the integrity of **stored TSF executable code**.

FPT_PHP.3/Global Resistance to physical attack

FPT_PHP.3.1/Global The TSF shall resist **physical manipulation and physical probing** to the **TSF** by responding automatically such that the SFRs are always enforced.

8.1.2. Product configuration SFR

This chapter adds some requirements on Manufacturing and Personalization SFR.

FCS_CKM.1/MP Cryptographic key generation

FCS_CKM.1.1 The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
MSK derivation from initial MSK loaded in phase 1 using SHA 256	256	None

FCS_COP.1/MP_ENC_3DES Cryptographic operation

FCS_COP.1.1/MP_ENC_3DES The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Secure Messaging – encryption and decryption	3DES in CBC mode	112	[13][12]

FCS_COP.1/MP_ENC_AES Cryptographic operation

FCS_COP.1.1/MP_ENC_AES The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Secure Messaging – encryption and decryption	AES in CBC mode	128, 192 and 256	[17]

FCS_COP.1/MP_MAC_3DES Cryptographic operation

FCS_COP.1.1/MP_MAC_3DES The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Secure Messaging – MAC	3DES RMAC	112	[15][13][12]

FCS_COP.1/MP_MAC_AES Cryptographic operation

FCS_COP.1.1/MP_MAC_AES The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Secure Messaging MAC	AES	128, 192 and 256	[17]

FCS_COP.1/MP_AUTH_3DES Cryptographic operation

FCS_COP.1.1/MP_AUTH_3DES The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Card Manufacturer Authentication (MSK)	3DES	112	[12]

FCS_COP.1/MP_AUTH_AES Cryptographic operation

FCS_COP.1.1/MP_AUTH_AES The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Card Manufacturer Authentication (MSK)	AES	128, 192 and 256	[17]

FCS_COP.1/MP_SHA Cryptographic operation

FCS_COP.1.1/MP_SHA The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Cryptographic operation	Algo	Key length (bits)	Standard
Hashing	SHA256	None	[29]

FDP_ACC.2/MP Complete access control

FDP_ACC.2.1/MP The TSF shall enforce the **Prepersonalization Access Control** on **all subjects and all objects** and all operations among subjects and objects covered by the SFP.

FDP_ACC.2.2/MP The TSF shall ensure that all operations between any subject controlled by the TSF and any object controlled by the TSF are covered by an access control SFP.

FDP_ACF.1/MP Security attribute based access control

FDP_ACF.1.1/**MP** The TSF shall enforce the **Prepersonalization Access Control** to objects based on the following **Prepersonalizer Authentication (AS_AUTH_MSK_STATUS).**

FDP_ACF.1.2/MP The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: **AS_AUTH_MSK_STATUS=TRUE (EXTERNAL AUTHENTICATE)**.

FDP_ACF.1.3/MP The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: **none**.

FDP_ACF.1.4/MP The TSF shall explicitly deny access of subjects to objects based on the following additional rules: **none**.

Application Note
This SFR enforces access control over all the operation in phase 5.

AS_AUTH_MSK_STATUS is related to authentication status or the prepersonalizer. If the Authentication is successful, the AS_AUTH_MSK_STATUS is set to true. Otherwise the AS_AUTH_MSK_STATUS is set to false.

FDP_ITC.1/MP Import of user data without security attributes

FDP_ITC.1.1/MP The TSF shall enforce the **Prepersonalization access control** when importing user data, controlled under the SFP, from outside of the TOE.

FDP_ITC.1.2/MP The TSF shall ignore any security attributes associated with the user data when imported from outside the TOE.

FDP_ITC.1.3/MP The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: **none**.

Application Note
This SFR control import of data in phase 5.
This SFR ensures also the MSK diversification, which is performs once, at first command, without any security requirements preliminary to this action.

FDP_UCT.1/MP Basic data exchange confidentiality

FDP_UCT.1.1/MP The TSF shall enforce the **Prepersonalization access control** to **receive** user data in a manner protected from unauthorised disclosure.

FDP_UIT.1/MP Data exchange integrity

FDP_UIT.1.1/MP The TSF shall enforce the **Prepersonalization Access Control SFP** to **receive** user data in a manner protected from **modification** errors

FDP_UIT.1.2/MP [Editorially refined] The TSF shall be able to determine on receipt of user data, whether modification of some pieces of the application sent by the Prepersonalizer has occurred

FIA_AFL.1/MP Authentication failure handling

FIA_AFL.1.1/MP The TSF shall detect when **3** unsuccessful authentication attempts occur related to **authentication of**
1. Prepersonalizer
FIA_AFL.1.2/MP When the defined number of unsuccessful authentication attempts has been **met**, the TSF shall **forbid any authentication attempt as Personalizer**.

FIA_UAU.1/MP Timing of authentication

FIA_UAU.1.1/MP The TSF shall allow **GET DATA, SELECT FILE** on behalf of the user to be performed before the user is authenticated.

FIA_UAU.1.2/MP The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

FIA_UID.1/MP Timing of identification

FIA_UID.1.1/MP The TSF shall allow **GET DATA, SELECT FILE** on behalf of the user to be performed before the user is identified.

FIA_UID.1.2/MP The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

FIA_UAU.4/MP_3DES Single-use authentication mechanisms

FIA_UAU.4.1/MP_3DES The TSF shall prevent reuse of authentication data related to
1. Authentication Mechanisms based on 3DES

FIA_UAU.4/MP_AES Single-use authentication mechanisms

FIA_UAU.4.1/MP_AES The TSF shall prevent reuse of authentication data related to
1. Authentication Mechanisms based on AES

FIA_UAU.5/MP_3DES Multiple authentication mechanisms

FIA_UAU.5.1/MP_3DES The TSF shall provide
1. Symmetric Authentication Mechanism based on 3DES
to support user authentication.

FIA_UAU.5.2/MP_3DES The TSF shall authenticate any user's claimed identity according to the
1. The TOE accepts the authentication attempt as Personalization Agent by the Symmetric Authentication Mechanism with the Personalization Agent Key

FIA_UAU.5/MP_AES Multiple authentication mechanisms

FIA_UAU.5.1/MP_AES The TSF shall provide
1. Symmetric Authentication Mechanism based on AES to support user authentication.

FIA_UAU.5.2/MP_AES The TSF shall authenticate any user's claimed identity according to the
1. The TOE accepts the authentication attempt as Personalization Agent by the Symmetric Authentication Mechanism with Personalization Agent Key

FMT_MTD.1/MP Management of TSF data

FMT_MTD.1.1/MP The TSF shall restrict the ability to switch the TOE life cycle from phase 5 to phase 6 to the Prepersonalizer.

FTP_ITC.1/MP Inter-TSF trusted channel

FTP_ITC.1.1/MP The TSF shall provide a communication channel between itself and another trusted IT product that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification or disclosure.

FTP_ITC.1.2/MP [Editorially Refined] The TSF shall permit **the Prepersonalizer** to initiate communication via the trusted channel.

FTP_ITC.1.3/MP The TSF shall initiate communication via the trusted channel for:
1. Personalization Agent key storage
2. Life cycle transition from Prepersonalization to Personalization phase

FMT_MTD.1/MP_INI_ENA Management of TSF data

FMT_MTD.1.1/MP_INI_ENA The TSF shall restrict the ability to write the Initialization Data and Prepersonalization Data to the Prepersonalizer.

FMT_MTD.1/MP_INI_DIS Management of TSF data

FMT_MTD.1.1/MP_INI_DIS The TSF shall restrict the ability to disable read access for users to the Initialization Data to the Personalization Agent.

FMT_MTD.1/MP_KEY_READ Management of TSF data

FMT_MTD.1.1/MP_KEY_READ The TSF shall restrict the ability to read the [data] to [authorized identified roles]:

TSF Data	Authorized Identified roles
MSK	None
Personalization Agent Keys	None

FMT_MTD.1/MP_KEY_WRITE Management of TSF data

FMT_MTD.1.1/MP_KEY_WRITE The TSF shall restrict the ability to write the [data] to [authorized identified roles]:

TSF Data	Authorized Identified roles
MSK	IC manufacturer (created by the developer)
Personalization Agent Keys	None

FAU_SAS.1/MP Audit storage

FAU_SAS.1.1/MP The TSF shall provide **the Manufacturer** with the capability to store **the IC Identification Data** in the audit records.

FMT_SMF.1/MP Specification of Management Functions

FMT_SMF.1.1/MP The TSF shall be capable of performing the following management functions:
1. Initialization
2. Pre-personalization
3. Personalization

FMT_SMR.1/MP Security roles

FMT_SMR.1.1/MP The TSF shall maintain the roles
1. Manufacturer
2. Personalization Agent

FMT_SMR.1.2/MP The TSF shall be able to associate users with roles.

FPT_EMS.1/MP TOE Emanation

FPT_EMS.1.1/MP The TOE shall not emit power variations, timing variations during command execution in excess of non useful information enabling access to
1. Prepersonalizer Key
2. Personalization Agent Key
3. MSK

FPT_EMS.1.2/MP The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to
1. Prepersonalizer Key
2. Personalization Agent Key
3. MSK

8.1.3. Active Authentication SFR

FCS_COP.1/AA_DSA Cryptographic operation

FCS_COP.1.1/AA_DSA The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Operation	Algorithm	Key length (bits)	Standard
Digital Signature Creation	RSA signature (CRT) with SHA1, 224, 256, 384, 512	1024, 1536 and 2048.	[24]

FCS_COP.1/AA_ECDSA Cryptographic operation

FCS_COP.1.1/AA_ECDSA The TSF shall perform **[cryptographic operation]** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[cryptographic key sizes]** that meet the following **[standard]**:

Operation	Algo	Key length (bits)	Standard
Digital Signature Creation	ECDSA with SHA1, 224, 256, 384, 512	192 to 512 over prime field curves	[24] [28][29][30]

FDP_DAU.1/AA Basic Data Authentication

FDP_DAU.1.1/AA The TSF shall provide a capability to generate evidence that can be used as a guarantee of the validity of **the TOE itself**.

FDP_DAU.1.2/AA The TSF shall provide **any users** with the ability to verify evidence of the validity of the indicated information.

Refinement:
Evidence generation and ability of verifying it constitute the Active Authentication protocol.

FDP_ITC.1/AA Import of user data without security attributes

FDP_ITC.1.1/AA The TSF shall enforce the **Active Authentication Access Control SFP** when importing user data, controlled under the SFP, from outside of the TOE.

FDP_ITC.1.2/AA The TSF shall ignore any security attributes associated with the user data when imported from outside the TOE.

FDP_ITC.1.3/AA The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: **none**.

FMT_MTD.1/AA_KEY_READ Management of TSF data

FMT_MTD.1.1/AA_KEY_READ The TSF shall restrict the ability to **read** the **AAK** to **none**.

FPT_EMS.1/AA TOE Emanation

FPT_EMS.1.1/AA The TOE shall not emit power variations, timing variations during command execution in excess of non useful information enabling access to
1. Active Authentication: Private Key (AAK)

FPT_EMS.1.2/AA The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to
1. Active Authentication: Private Key (AAK)

FMT_MOF.1/AA Management of security functions behaviour

FMT_MOF.1.1/AA The TSF shall restrict the ability to disable and enable the functions TSF Active Authentication to Personalization Agent.

FMT_MTD.1/AA_KEY_WRITE Management of TSF data

FMT_MTD.1.1/AA_KEY_WRITE The TSF shall restrict the ability to write the AAK to Personalization Agent.

8.1.4. Chip Authentication SFR

FIA_API.1/CA Authentication Proof of Identity

FIA_API.1.1/CA The TSF shall provide a **Chip Authentication protocol according [48] to** prove the identity of the TOE.

FCS_CKM.1/CA_DH_SM_3DES Cryptographic key generation

FCS_CKM.1.1/CA_DH_SM_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on the Key Diffie-Hellman key derivation protocol compliant to PKCS#3	112	[28]

FCS_CKM.1/CA_DH_SM_AES Cryptographic key generation

FCS_CKM.1.1/CA_DH_SM_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on the Key Diffie-Hellman key derivation protocol compliant to PKCS#3	128, 192, 256	[28]

FCS_CKM.1/CA_ECDH_SM_3DES Cryptographic key generation

FCS_CKM.1.1/CA_ECDH_SM_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on ECDH key derivation protocol compliant to ISO 15946	112	[39]

FCS_CKM.1/CA_ECDH_SM_AES Cryptographic key generation

FCS_CKM.1.1/CA_ECDH_SM_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
Algorithm based on ECDH key derivation protocol compliant to ISO 15946	128, 192, 256	[39]

FCS_COP.1/CA_SHA_SM_3DES Cryptographic key generation

FCS_COP.1.1/CA_SHA_SM_3DES The TSF shall perform **hashing** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
SHA1	None	[29]

FCS_COP.1/CA_SHA_SM_AES Cryptographic key generation

FCS_COP.1.1/CA_SHA_SM_AES The TSF shall perform **hashing** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
SHA1	None	[29]

FCS_COP.1/CA_SYM_SM_3DES Cryptographic key generation

FCS_COP.1.1/CA_SYM_SM_3DES The TSF shall perform **SM encryption and decryption** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
3DES CBC mode	112	[48]

FCS_COP.1/CA_SYM_SM_AES Cryptographic key generation

FCS_COP.1.1/CA_SYM_SM_AES The TSF shall perform **SM encryption and decryption** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
AES	128, 192 and 256	[48]

FCS_COP.1/CA_MAC_SM_3DES Cryptographic key generation

FCS_COP.1.1/CA_MAC_SM_3DES The TSF shall perform **SM message authentication code** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
3DES Retail MAC	112	[15]

FCS_COP.1/CA_MAC_SM_AES Cryptographic key generation

FCS_COP.1.1/CA_MAC_SM_AES The TSF shall perform **SM message authentication code** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
AES CMAC	128, 192 and 256	[48]

FDP_ITC.1/CA Import of user data without security attributes

FDP_ITC.1.1/CA The TSF shall enforce the **Chip Authentication Access Control SFP** when importing user data, controlled under the SFP, from outside of the TOE.

FDP_ITC.1.2/CA The TSF shall ignore any security attributes associated with the user data when imported from outside the TOE.

FDP_ITC.1.3/CA The TSF shall enforce the following rules when importing user data controlled under the SFP from outside the TOE: **none**.

FIA_UAU.1/CA Timing of authentication

FIA_UAU.1.1/CA The TSF shall allow:
1. To establish the communication channel
2. To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS
3. To identify themselves by selection of the authentication key
4. To carry out the Chip Authentication Protocol
on behalf of the user to be performed before the user is authenticated.

FIA_UAU.1.2/CA The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

FIA_UAU.5/CA_3DES Multiple authentication mechanisms

FIA_UAU.5.1/CA_3DES The TSF shall provide
1. Secure Messaging in MAC-ENC mode
2. Symmetric Authentication Mechanism based on 3DES
to support user authentication.

FIA_UAU.5.2/CA_3DES The TSF shall authenticate any user's claimed identity according to the
1. After run of the Chip Authentication Protocol the TOE accepts only received commands with correct message authentication code sent by means of secure messaging with key agreed with the terminal by means of the Chip Authentication Mechanism.

FIA_UAU.5/CA_AES Multiple authentication mechanisms

FIA_UAU.5.1/CA_AES The TSF shall provide
1. Secure Messaging in MAC-ENC mode
2. Symmetric Authentication Mechanism based on AES
to support user authentication.

FIA_UAU.5.2/CA_AES The TSF shall authenticate any user's claimed identity according to the
1. After run of the Chip Authentication Protocol the TOE accepts only received commands with correct message authentication code sent by means of secure messaging with key agreed with the terminal by means of the Chip Authentication Mechanism.

FIA_UAU.6/CA Re-authenticating

FIA_UAU.6.1/CA The TSF shall re-authenticate the user under the **conditions each command sent to the TOE after successful run of the CA shall be verified as being sent by the inspection system.**

FIA_UID.1/EAC Timing of identification

FIA_UID.1.1/EAC The TSF shall allow
1. To establish the communication channel
2. To read the Initialization Data if it is not disbled by TSF according to FMT_MTD.1/INI_DIS
3. To carry out th Chip Authentication Protocol
4. To carry out the Terminal Authentication Protocol
on behalf of the user to be performed before the user is identified.

FIA_UID.1.2/CA The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

FPT_EMS.1/CA TOE Emanation

FPT_EMS.1.1/CA The TOE shall not emit **power variations, timing variations during command execution** in excess of **non useful information** enabling access to
1. Chip Authentication: Session Keys, Private Key (CAK)

FPT_EMS.1.2/CA The TSF shall ensure any **unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to
1. Active Authentication: Session Keys, Private Key (CAK)

FPT_TST.1/CA TSF testing

FPT_TST.1.1/CA The TSF shall run a suite of self tests to demonstrate the correct operation of **the TSF, at the conditions:**

When performing the Chip Authentication

FPT_TST.1.2/CA The TSF shall provide authorised users with the capability to verify the integrity of **TSF data**.

FPT_TST.1.3/CA The TSF shall provide authorised users with the capability to verify the integrity of **stored TSF executable code**.

FMT_MTD.1/CA_KEY_WRITE Management of TSF data

FMT_MTD.1.1/CA_KEY_WRITE The TSF shall restrict the ability to **write** the **CAK** to **Personalization Agent.**

FMT_MTD.1/CA_KEY_READ Management of TSF data

FMT_MTD.1.1/CA_KEY_READ The TSF shall restrict the ability to **read** the **CAK** to **none**.

FDP_UCT.1/CA Basic data exchange confidentiality

FDP_UCT.1.1/CA [Editorially Refined] The TSF shall enforce the **Access Control SFP** to **transmit and receive** user data in a manner protected from unauthorised disclosure **after Chip Authentication protocol**.

FDP_UIT.1/CA Data exchange integrity

FDP_UIT.1.1/CA [Editorially Refined] The TSF shall enforce the **Access Control SFP** to **transmit and receive** user data in a manner protected from **modification, deletion, insertion and replay** errors **after Chip Authentication protocol**

FDP_UIT.1.2/CA [Editorially Refined] The TSF shall be able to determine on receipt of user data, whether **modification, deletion, insertion and replay** has occurred **after Chip Authentication protocol**

8.1.5. PACE SFR

FCS_CKM.1/ECDH_PACE_3DES Cryptographic key generation

FCS_CKM.1.1/ECDH_PACE_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
ECDH key derivation protocol compliant to PKCS#3	**3DES 2 keys**	**[43]**

FCS_CKM.1/ECDH_PACE_AES Cryptographic key generation

FCS_CKM.1.1/ECDH_PACE_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
ECDH key derivation protocol compliant to ISO 15946	**128, 192 & 256**	**[43]**

FCS_CKM.1/DH_PACE_3DES Cryptographic key generation

FCS_CKM.1.1/DH_PACE_3DES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
DH key derivation protocol compliant to PKCS#3	**3DES 2 keys**	**[43]**

FCS_CKM.1/DH_PACE_AES Cryptographic key generation

FCS_CKM.1.1/DH_PACE_AES The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **[cryptographic key generation algorithm]** and specified cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic key generation algorithm	Key length (bits)	Standards
DH key derivation protocol compliant to ISO 15946	128, 192 & 256	[43]

FCS_COP.1/PACE_ENC_AES Cryptographic key generation

FCS_COP.1.1/PACE_ENC_AES The TSF shall perform **Secure Messaging – encryption and decryption** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
AES in CBC mode	128, 192 and 256	[53]

FCS_COP.1/PACE_ENC_3DES Cryptographic key generation

FCS_COP.1.1/PACE_ENC_3DES The TSF shall perform **Secure Messaging – encryption and decryption** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
3DES in CBC mode	112	[53]

FCS_COP.1/PACE_MAC_AES Cryptographic key generation

FCS_COP.1.1/PACE_MAC_AES The TSF shall perform **Secure Messaging – Message Authentication Code** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
CMAC AES	128, 192 and 256	[53]

FCS_COP.1/PACE_MAC_3DES Cryptographic key generation

FCS_COP.1.1/PACE_MAC_3DES The TSF shall perform **Secure Messaging – Message Authentication Code** in accordance with a specified cryptographic algorithm **[cryptographic algorithm]** and cryptographic key sizes **[key length]** that meet the following **[standard]**:

Cryptographic algorithm	Key length (bits)	Standards
Retail MAC with 3DES	112	[53]

FDP_ACC.1/TRM Complete access control

FDP_ACC.1.1/TRM The TSF shall enforce the **Access Control SFP** on **terminals gaining access to the User Data and data stored in EF.SOD of the logical travel document and active Authentication private key of the logical MRTD.**

FDP_ACF.1/TRM Security attribute based access control

FDP_ACF.1.1/TRM The TSF shall enforce the **Access Control SFP** to objects based on the following
1. Subjects:
a. Terminal
b. BIS-PACE
c. Extended Inspection System
2. Objects:
a. Data in EF.DG1, EF.DG2 and EF.DG5 to EF.DG16, EF.SOD and EF.COM of the logical MRTD
b. Data in EF.DG3 of the logical MRTD
c. Data in EF.DG4 of the logical MRTD
d. All TOE intrinsic secret cryptographic keys stored in the travel document
3. Security attributes:
a. PACE Authentication
b. Terminal Authentication
c. Authorization of the Terminal

FDP_ACF.1.2/TRM The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed: **A BIS-PACE is allowed to read data objects from FDP.ACF.1.1/TRM according to [4] after a successful PACE authentication a required by FIA_UAU.1/PACE**

FDP_ACF.1.3/TRM The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: **none**.

FDP_ACF.1.4/TRM The TSF shall explicitly deny access of subjects to objects based on the following additional rules:
1. Any terminal being not authenticated as PACE authenticated BIS-PACE is not allowed to read, to write, to modify, to use any User Data stored on the travel document
2. Terminals not using secure messaging are not allowed to read, to write, to modify, to use any data stored on the travel document

FDP_RIP.1 Subset residual information protection

FDP_RIP.1.1 The TSF shall ensure that any previous information content of a resource is made unavailable upon the **allocation of the ressource to and deallocation of the resource from** the following objects:
1. Session Keys (immediately after closing related communication session)
2. The ephemeral private key ephem-SKPICC- PACE (by having generated a DH shared secret)

FDP_UCT.1/TRM Basic data exchange confidentiality - MRTD

FDP_UCT.1.1/TRM The TSF shall enforce the **Access Control SFP** to be able to **transmit and receive** user data in a manner protected from unauthorised disclosure.

FDP_UIT.1/TRM Data exchange integrity

FDP_UIT.1.1/TRM The TSF shall enforce the **Access Control SFP** to be able to **transmit and receive** user data in a manner protected from **modification, deletion, insertion and replay** errors

FDP_UIT.1.2/TRM The TSF shall be able to determine on receipt of user data, whether **modification, deletion, insertion and replay** has occurred

FIA_AFL.1/PACE Authentication failure handling

FIA_AFL.1.1/PACE The TSF shall detect when **an administrator configurable positive integer within range of acceptable values 0 to 255 consecutive** unsuccessful authentication attempts occur related to **authentication attempts using the PACE password as shared password**

FIA_AFL.1.2/PACE [Editorially Refined] When the defined number of unsuccessful authentication attempts has been **met**, the TSF shall **wait for an increasing time between receiving of the terminal challenge and sending of the TSF response during the PACE authentication attempts.**

FIA_UAU.1/PACE Timing of authentication

FIA_UAU.1.1/PACE The TSF shall allow
1. To establish the communication channel
2. Carrying out the PACE Protocol according to [4]
3. To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS
4. To identify themselves by selection of the authentication key
on behalf of the user to be performed before the user is authenticated.

FIA_UAU.1.2/PACE The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

FIA_UAU.4/PACE Single-use authentication mechanisms

FIA_UAU.4.1/PACE The TSF shall prevent reuse of authentication data related to
1. PACE Protocol according to [4]

FIA_UAU.5/PACE Multiple authentication mechanisms

FIA_UAU.5.1/PACE The TSF shall provide
1. PACE Protocol according to [4]
2. Passive Authentication according to [6]
3. Secure messaging in MAC-ENC mode according to [4]
to support user authentication.

FIA_UAU.5.2/PACE The TSF shall authenticate any user's claimed identity according to the **following rules:**
1. Having successfully run the PACE protocol the TOE accepts only received commands with correct message authentication code sent by means of secure messaging with the key agreed with the terminal by means of the PACE protocol

FIA_UAU.6/PACE Re-authenticating

FIA_UAU.6.1/PACE The TSF shall re-authenticate the user under the conditions **each command sent to the TOE after successful run of the PACE protocol shall be verified as being sent by the PACE terminal**

FIA_UID.1/PACE Timing of identification

FIA_UID.1.1/PACE The TSF shall allow
1. To establish the communication channel
2. Carrying out the PACE Protocol according to [4]
3. To read the Initialization Data if it is not disabled by TSF according to FMT_MTD.1/INI_DIS
on behalf of the user to be performed before the user is identified.

FIA_UID.1.2/PACE The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

FMT_MTD.1/PACE_KEY_READ Management of TSF data

FMT_MTD.1.1/PACE_KEY_READ The TSF shall restrict the ability to **read** the
1. PACE passwords
to **none**.

FMT_SMR.1/PACE Security roles

FMT_SMR.1.1/PACE The TSF shall maintain the roles
1. Terminal
2. PACE authenticated BIS-PACE

FMT_SMR.1.2/PACE The TSF shall be able to associate users with roles.

FPT_EMS.1/PACE TOE Emanation

FPT_EMS.1.1/PACE The TOE shall not emit **power variations, timing variations during command execution** in excess of **non useful information** enabling access to
1. PACE: Session Keys (PACE-KMAC, PACE-KENC), Ephemeral Private Key ephem SKPICC-PACE

FPT_EMS.1.2/PACE The TSF shall ensure **any users** are unable to use the following interface **smart card circuit contacts** to gain access to
1. PACE: Session Keys (PACE-KMAC, PACE-KENC), Ephemeral Private Key ephem SKPICC-PACE

FTP_ITC.1/PACE Inter-TSF trusted channel

FTP_ITC.1.1/PACE The TSF shall provide a communication channel between itself and another trusted IT product that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification or disclosure.

FTP_ITC.1.2/PACE The TSF shall permit another trusted IT product to initiate communication via the trusted channel.

FTP_ITC.1.3/PACE The TSF shall **enforce** communication via the trusted channel for **any data exchange between the TOE and the Terminal**

FPT_TST.1/PACE TSF testing

FPT_TST.1.1/PACE The TSF shall run a suite of self tests to demonstrate the correct operation of self tests **at the conditions:**

- **When performing a PACE authentication**

to demonstrate the correct operation of the **TSF**

FPT_TST.1.2/PACE The TSF shall provide authorised users with the capability to verify the integrity of **TSF data**.

FPT_TST.1.3/PACE The TSF shall provide authorised users with the capability to verify the integrity of **stored TSF executable code**.

FMT_MTD.1/PA Management of TSF data

FMT_MTD.1.1/PA The TSF shall restrict the ability to **write** the **Document Security Objects (SOD)** to **Personalization Agent**.

8.1.6. PACE CAM SFR

FIA_UAU.1/PACE_CAM Timing of authentication

FIA_UAU.1.1/PACE_CAM The TSF shall allow
1. Carrying out the PACE Protocol according to [4]
on behalf of the user to be performed before the user is authenticated.

FIA_UAU.1.2/PACE_CAM The TSF shall require each user to be successfully authenticated before allowing any other TSF-mediated actions on behalf of that user.

FIA_UAU.4/PACE_CAM Single-use authentication mechanisms

FIA_UAU.4.1/PACE_CAM The TSF shall prevent reuse of authentication data related to
Aditionally to FIA_UAU.4/PACE
1. PACE CAM Protocol according to [4]

FIA_UAU.5/PACE_CAM Multiple authentication mechanisms

FIA_UAU.5.1/PACE_CAM The TSF shall provide
1. PACE CAM Protocol according to [4]
to support user authentication.

FIA_UAU.5.2/PACE_CAM The TSF shall authenticate any user's claimed identity according to the **following rules:**
The same rules from FIA_UAU.5.2/PACE applies, with the PACE_CAM protocol

FIA_UAU.6/PACE_CAM Re-authenticating

FIA_UAU.6.1/PACE_CAM The TSF shall re-authenticate the user under the conditions **each command sent to the TOE aftter successful run of the PACE CAM protocol shall be verified as being sent by the PACE terminal**

FIA_UID.1/PACE_CAM Timing of identification

FIA_UID.1.1/PACE_CAM The TSF shall allow **additionally to FIA_UID.1/PACE:**
1. Carrying out the PACE CAM Protocol according to [4]
on behalf of the user to be performed before the user is identified.

FIA_UID.1.2/PACE_CAM The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

FMT_MTD.1/PACE_CAM_KEY_READ Management of TSF data

FMT_MTD.1.1/PACE_CAM_KEY_READ The TSF shall restrict the ability to **read** the
1. PACE CAM Private Key
to **none**.

FMT_MTD.1/PACE_CAM_KEY_WRITE Management of TSF data

FMT_MTD.1.1/PACE_CAM_KEY_WRITE The TSF shall restrict the ability to **write** the **PACE CAM private key** to **Personalization Agent**

8.2. Security Assurance Requirements

The security assurance requirement level is EAL5+ augmented with ALC_DVS.2, AVA_VAN.5.

8.2.1. Rationale for augmentation

8.2.1.1. ALC_DVS.2 Sufficiency of security measures

The selection of the component ALC_DVS.2 provides a higher assurance of the security of the MRTD's development and manufacturing especially for the secure handling of the MRTD's material.

Development security is concerned with physical, procedural, personnel and other technical measures that may be used in the development environment to protect the TOE. This assurance component is a higher hierarchical component to EAL5 (only ALC_DVS.1). Due to the nature of the TOE, there is a need for any justification of the sufficiency of these procedures to protect the confidentiality and integrity of the TOE.

The component ALC_DVS.2 augmented to EAL5 has no dependencies to other security requirements.

8.2.1.2. AVA_VAN.5 Advanced methodical vulnerability analysis

Due to the definition of the TOE, it must be shown to be highly resistant to penetration attacks. This assurance requirement is achieved by the AVA_VAN.5 component.
Advanced methodical vulnerability analysis is based on highly detailed technical information. The attacker is assumed to be thoroughly familiar with the specific implementation of the TOE. The attacker is presumed to have a high level of technical sophistication. AVA_VAN.5 has dependencies with ADV_ARC.1 "Security architecture description", ADV_FSP.4 "Complete functional specification", ADV_IMP.1 "Implementation representation of the TSF", ADV_TDS.3 "Basic modular design", AGD_PRE.1 "Preparative procedures" and AGD_OPE.1 "Operational user Guidance" and ATE_DPT.1 "Testing: basic design".

All these dependencies are satisfied by EAL5.

9. TOE SUMMARY SPECIFICATION

9.1. TOE Summary Specification

Access Control in reading

This function controls access to read functions and enforces the security policy for data retrieval. Prior to any data retrieval, it authenticates the actor trying to access the data, and checks the access conditions are fulfilled as well as the life cycle state.
It ensures that at any time, the following keys are never readable:

- PACE keys
- PACE CAM keys
- Active Authentication private key
- Personalization Agent keys
- MSK
- CVCA keys

It controls access to the CPLC data as well:
It ensures the CPLC data can be read during the personalization phase
It ensures it cannot be readable in free mode at the end of the personalization step.

Regarding the file structure:

<u>In the operational use:</u>

- The terminal can read user data (except DG3 & DG4), the Document Security Object, EF.CVA, EF.COM only after PACE authentication and through a valid secure channel.
- When the EAC was successfully performed, the terminal can only read the DG3 & DG4 provided the access rights are sufficient throught a valid secure channel.

<u>In the personalization phase:</u>

- The Personalization Agent can read all the data stored in the TOE after it is authenticated by the TOE (using its authentication keys).

It ensures as well that no other part of the memory can be accessed at anytime

Access Control in writing

This function controls access to write functions (in EEPROM) and enforces the security policy for data writing. Prior to any data update, it authenticates the actor, and checks the access conditions are fulfilled as well as the life cycle state.
It ensures as well the CPLC data cannot be written anymore once the TOE is personalized.

Regarding the file structure:

<u>In the operational use</u>:

It is not possible to create any files (system or data files). Furthermore, it is not possible to update any system files. However the application data is still accessed internally by the application for its own needs.
The root CVCA key files and temporary key files are updated internally by the application according to the authentication mechanism described in [45].

<u>In the personalization phase</u>

The Personalization Agent can create and write through a valid secure channel all the data files it needs after it is authenticated by the TOE (using its authentication keys).

Active Authentication

This security functionality ensures the Active Authentication is performed as described in [45]. (if it is activated by the personnaliser).

Chip Authentication

This security functionality ensures the Chip Authentication is performed as described in [45]. (if it is activated by the personnaliser). It could be used as an alternative of Active Authentication to reinforce the Authentication of the Chip. It differs from an EAC not performing the Terminal Authentication.

PACE mechanism
This security functionality ensures the PACE is correctly performed. It can only be performed once the TOE is personalized with the PACE password. Furthermore, this security functionalities ensures the correct calculation of the PACE session keys.

PACE_CAM mechanism
This security functionality ensures the PACE_CAM is correctly performed. It can only be performed once the TOE is personalized with:

- the chip authentication mapping (CAM) keys the Personnalization Agent loaded during the personalization phase
- the PACE password.

Furthermore, this security functionality ensures the correct calculation of the PACE_CAM session keys.

Personalization
This security functionality ensures the TOE, when delivered to the Personnalization Agent, demands an authentication prior to any data exchange. This authentication is based on a symmetric Authentication mechanism based on a Triple DES or AES algorithm. This TSF can use a Secure Messaging described in the TSF Secure Messaging.

This function allow to configure SM level for biometrical data access and the BAC deactivation mechanism

Physical protection
This security functionality protects the TOE against physical attacks.

Prepersonalization
This security functionality ensures the TOE, when delivered to the Prepersonalization Agent, demands an authentication prior to any data exchange. This authentication is based on a symmetric Authentication mechanism based on a Triple DES or AES algorithm. This function is in charge of pre-initializing the product. This TSF can use a Secure Messaging described in the TSF Secure Messaging.

Safe state management
This security functionalities ensures that the TOE gets back to a secure state when

- an integrity error is detected by F.SELFTESTS
- a tearing occurs (during a copy of data in EEPROM)

This security functionality ensures that such a case occurs, the TOE is either switched in the state "kill card" or becomes mute.

Secure Messaging
This security functionality ensures the confidentiality, authenticity & integrity of the communication between the TOE and the IFD.
After a successful PACE authentication and successful Chip Authentication, a secure channel is established based on Triple DES algorithm, and after a successful Chip Authentication , a secure channel is (re)established based on Symmetric algorithms (Triple DES, AES128, 192 or 256)
This security functionality ensures:

- No commands were inserted, modified nor deleted within the data flow
- The data exchanged remain confidential
- The issuer of the incoming commands and the destinatory of the outgoing data is the one that was authenticated (through PACE or EAC)

If an error occurs in the secure messaging layer, the session keys are destroyed.
This Secure Messaging can be combined with the Active Authentication.
This TSF can provide a GP Secure Messaging (SCP02 or SCP03) for the Prepersonalization or Personalization.

Self tests
The TOE performs self tests to verify the integrity on the TSF data:

- Before the TSF data usage
- The integrity of keys and sensitive data is ensured

9.2. Link between the SFR and the TSF

The following chapters present the rationales between security objective and security requirements. For ease reading some requirements are merged.

- FIA_UAU.4/MP represents the 2 SFRS: FIA_UAU.4/MP_3DES and FIA_UAU.4/MP_AES
as the 2 sfrs have the same functionalities, single use authentication mechanisms are used with the same scope. The only difference is the used algorithms.

- FIA_UAU.5/MP represents the 2 SFRS: FIA_UAU.5/MP_3DES and FIA_UAU.5/MP_AES
as the 2 sfrs have the same functionalities, Multiple use authentication mechanisms are used with the same scope. The only difference is the used algorithms.

- FCS_COP.1/MP represents the 7 SFRS: FCS_COP.1/MP_AUTH_3DES, FCS_COP.1/MP_AUTH_AES, FCS_COP.1/MP_ENC_3DES, FCS_COP.1/MP_ENC_AES, FCS_COP.1/MP_MAC_3DES, FCS_COP.1/MP_MAC_AES and FCS_COP.1/MP_SHA.

All the SFRs provide equivalent service at personalisation phase: cryptographic authentication of the personalisation. The differences are related to algorithms used for the authentication.

	FCS_CKM.1/DH_PACE	FCS_CKM.4	FCS_COP.1/PACE_ENC	FCS_COP.1/PACE_MAC	FCS_RND.1	FIA_AFL.1/PACE	FIA_UID.1/PACE	FIA_UAU.1/PACE	FIA_UAU.4/PACE	FIA_UAU.5/PACE	FIA_UAU.6/PACE	FDP_ACC.1/TRM	FDP_ACF.1/TRM	FDP_RIP.1	FDP_UCT.1/TRM	FDP_UIT.1/TRM	FTP_ITC.1/PACE	FAU_SAS.1	FMT_SMF.1	FMT_SMR.1/PACE	FMT_LIM.1	FMT_LIM.2	FMT_MTD.1/INI_ENA	FMT_MTD.1/INI_DIS	FMT_MTD.1/KEY_READ	FMT_MTD.1/PA	FPT_EMS.1	FPT_FLS.1	FPT_TST.1	FPT_PHP.3
Access Control in reading			x	x		x	x	x	x	x	x	x	x		x	x	x			x				x	x					
Access Control in writing															x	x			x				x			x				
Active Authentication		x			x																						x			
Chip Authentication		x			x																						x			
PACE mechanism	x	x	x	x	x	x	x						x				x										x			
PACE_CAM mechanism		x			x																						x			
Personalization					x														x				x				x			
Physical protection																		x			x	x								x
Prepersonalization					x		x	x	x	x	x								x				x				x			
Safe state management																		x	x	x	x	x					x	x		
Secure Messaging	x	x	x	x	x		x	x	x	x	x		x	x			x										x			
Self tests					x																								x	

Table 29: Link between SFR from the PP0068v2 and TSF

	FCS_COP.1/AA	FDP_DAU.1/AA	FDP_ITC.1/AA	FMT_MOF.1/AA	FMT_MTD.1/AA_KEY_WRITE	FMT_MTD.1/AA_KEY_READ
Access Control in reading						
Access Control in writing			**X**			
Active Authentication	**X**	**X**	**X**	**X**	**X**	**X**
Chip Authentication						
PACE mechanism						
PACE_CAM mechanism						
Personalization						
Physical protection						
Prepersonalization						
Safe state management						
Secure Messaging						
Self tests						

Table 30: Link between SFR for AA and TSF

	FIA_API.1/CA	FCS_CKM.1/CA	FCS_COP.1/CA_SHA	FCS_COP.1/CA_ENC	FCS_COP.1/CA_MAC	FDP_ITC.1/CA	FIA_UAU.1/CA	FIA_UAU.5/CA	FIA_UAU.6/CA	FIA_UID.1/CA	FMT_MTD.1/CA_KEY_WRITE	FMT_MTD.1/CA_KEY_READ	FDP_UCT.1/CA	FDP_UIT.1/CA
Access Control in reading														
Access Control in writing														
Active Authentication														
Chip Authentication	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PACE mechanism														
PACE_CAM mechanism														
Personalization		X												
Physical protection														
Prepersonalization														
Safe state management														
Secure Messaging														
Self tests														

Table 31: Link between SFR for CA and TSF

	FCS_CKM.1/MP	FCS_COP.1/MP	FDP_ACC.2/MP	FDP_ACF.1/MP	FDP_ITC.1/MP	FDP_UCT.1/MP	FDP_UIT.1/MP	FIA_AFL.1/MP	FIA_UAU.1/MP	FIA_UID.1/MP	FIA_UAU.4/MP	FIA_UAU.5/MP	FMT_MTD.1/MP	FTP_ITC.1/MP	FMT_MTD.1/MP_KEY_READ	FMT_MTD.1/MP_KEY_WRITE
Access Control in reading			X	X					X	X					X	
Access Control in writing			X	X	X				X	X			X			X
Active Authentication																
Chip Authentication																
PACE mechanism																
PACE_CAM mechanism																
Personalization		X									X	X				
Physical protection																
Prepersonalization	X	X						X			X	X				
Safe state management																
Secure Messaging						X	X							X		
Self tests																

Table 32: Link between Additional SFR for MP and TSF

	FIA_UAU.1/PACE_CAM	FIA_UAU.4/PACE_CAM	FIA_UAU.5/PACE_CAM	FIA_UAU.6/PACE_CAM	FIA_UID.1/PACE_CAM	FMT_MTD.1/PACE_CAM_KEY_READ	FMT_MTD.1/PACE_CAM_KEY_WRITE
Access Control in reading	x	x	x	x	x	x	
Access Control in writing							x
Active Authentication							
EAC mechanism							
PACE mechanism							
PACE_CAM mechanism	x	x	x	x	x	x	x
Personalization							
Physical protection							
Prepersonalization					x		
Safe state management							
Secure Messaging	x	x	x		x		
Self tests							

Table 33: Link between Additional SFR for PACE_CAM and TSF

10. TOE RATIONALES SECURITY OBJECTIVES RATIONALE

Rationales are not provided in this public version.

11. ANNEX B: COMPOSITION WITH THE UNDERLYING JAVACARD OPEN PLATFORM

This annex discusses the composition with the underlying javacard platform [54] according to [6].This part is removed from the ST lite.