

ID-One™ ePass V2.2 on NXP  
In Supplemental Access Control (SAC) configuration  
With AA

Public Security Target



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# 1 Security Target introduction

## 1.1 Security Target identification

General identification:

Title:	Hermès 2 Security Target SAC
Editor:	Oberthur Technologies
CC version:	3.1 revision 3
EAL:	EAL5 + ALC_DVS.2 + AVA_VAN.5
PP(s):	ANSSI-CC-PP-2010/06

TOE technical identification:

Name:	ePass v2.2 on NXP P5CD081 in SAC configuration with AA
SAAAAR Rom code:	075021
SAAAAR Optional code:	076152

Chips identification:

IC Reference:	P5CD081 V1A of NXP
IC EAL:	EAL5 + ALC_DVS.2 + AVA_VAN.5
IC Certificate:	BSI-DSZ-CC-0555-2009

## 1.2 Overview of the TOE

The current document aims at defining the functions and assurance security requirements which apply to the ID-One™ ePass v2.2 on NXP smartcard.

It is composed of both an Integrated Circuit (IC) and an embedded software providing secure data management following ePassport specifications (BAC, EAC, and SAC) and driving licence specifications (BAP, EAP); this document is therefore a composite Security Target (ST).

In the following, the smartcard will be called "Target Of Evaluation" or TOE.

The TOE is a versatile device that can be easily configured in order to operate in different modes including BAC ePassport, EAC ePassport, SAC ePassport, BAP driving licence and EAP driving licence. It possesses a dual interface to perform contact and contactless communications to go beyond current ePassport usages.

This device can be proposed as inlay to integrate in secure document booklet but can also be provided in a regular credit card format especially in driving licence configurations.

## 2 TOE Description

This part of the Security Target describes the TOE as an aid to the understanding of its security requirements. It addresses the product type, the intended usage and the main features of the TOE.

### 2.1 TOE usages

State or organisation issues TOEs 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 ePassport configuration, verifying authenticity of electronic visa stored on the card and correspondence with the holder or checking driving licence validity during a police control.

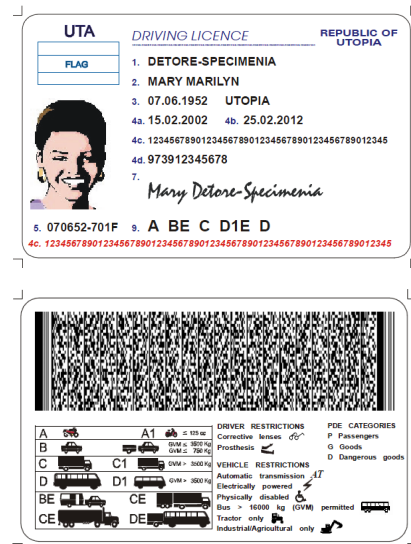
In order to pass successfully the control, the holder presents its personal TOE to the inspection system to first prove his/her identity. The inspection system is under control of an authorised agent and can be either a desktop device such as those present in airports or a portable device to be used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

The TOE 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, CAN<sup>1</sup> or keydoc data) for visual and machine reading using OCR methods in the Machine Readable Zone (MRZ, CAN 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 TOE 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 TOE.



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 "driving licence penalty points", "visa information"...

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



The TOE can be viewed as the combination:

- A physical TOE 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 TOE holder
  - (1) The biographical data on the biographical data page of the passport book,
  - (2) The printed data in the Machine-Readable Zone (MRZ), Card Acces Number (CAN) or keydoc area that identifies the device and
  - (3) The printed portrait.
- A logical TOE as data of the TOE holder stored according to the Logical Data Structure as specified by ICAO and extended in [R6], [R7], [R8], [R36] on the contactless integrated circuit. It

<sup>1</sup> Card Access Number (CAN) is a number printed in the front side of the datapage equivalent to MRZ and that can be easily typed manually. It's a SAC related terminology.



presents contact or contact-less readable data including (but not limited to) personal data of the TOE holder

- (4) The digital Machine Readable Zone Data (digital MRZ data, CAN or keydoc data, DG1),
- (5) The digitized portraits,
- (6) The optional biometric reference data of finger(s) or iris image(s) or both
- (7) The other data according to LDS (up to DG24) and
- (8) The Document security object.

The issuing State or Organization implements security features of the TOE to maintain the authenticity and integrity of the TOE and its data. The TOE as the physical device and the MRTD's chip is uniquely identified by the document number.



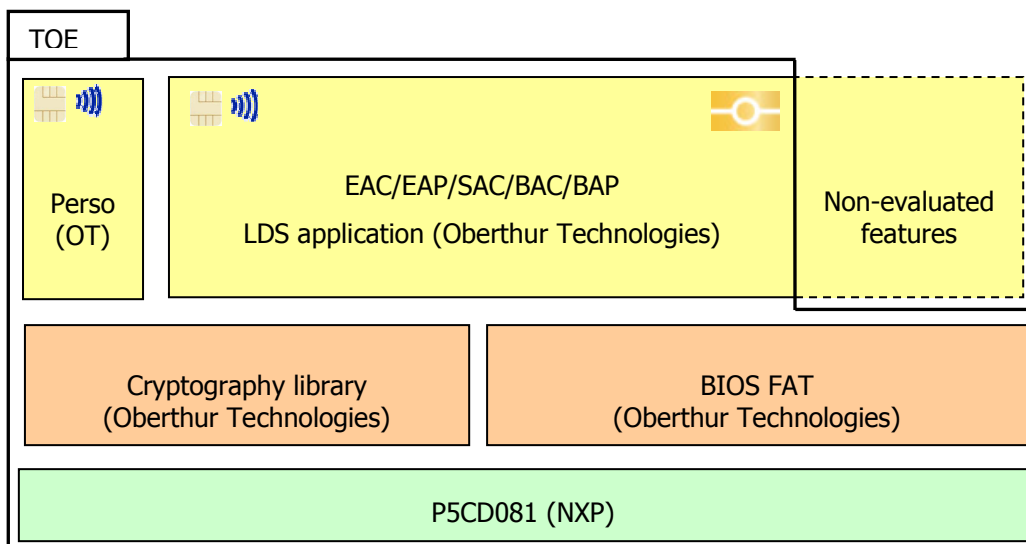
The physical TOE is protected by physical security measures (e.g. watermark on paper, security printing), logical (e.g. authentication keys of the TOE's chip) and organisational security measures (e.g. control of materials, personalisation procedures). These security measures include the binding of the TOE's chip to the physical support.

The logical TOE 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 TOE's chip.

## 2.2 TOE architecture

The Target of Evaluation (TOE) is a smartcard composed of the following components:

- An underlying P5CD081 chip of NXP,
- A native "BIOS FAT" allowing efficient access to chip functionalities,
- A dedicated highly secure cryptographic library,
- A personalisation application on top of the BIOS,
- An LDS application providing both the BAC/EAC and BAP/EAP/SAC features on top of the BIOS.



**Figure 1 TOE architecture<sup>2</sup>**

<sup>2</sup> OT is the acronym of Oberthur Technologies.

### 2.2.1 Integrated Circuit (IC)

The TOE relies on the functional and security features of the P5CD081. This chip is designed to embed the secure code of Oberthur Technologies for the production of smart cards.

This chip provides the following major features:

- Die integrity,
- Monitoring of environmental parameters,
- Protection mechanisms against faults,
- A FameXE Enhanced Public key coprocessor especially for RSA and ECC,
- A 3DES coprocessor,
- An AES coprocessor,
- AIS-31 class P2 compliant Random Number Generator,
- A CRC calculation block.

For more details, see [R14].

### 2.2.2 Basic Input/Output System (BIOS)

The native BIOS of Oberthur Technologies provides an efficient and easy way to access chip features from the applications. Indeed, it is based on services organized according to a multi-layer design which allows applications to use a high level interface completely independent of the chip.

The main features of the OS are the following:

- EEPROM management including secure data processing,
- Other memories management,
- Transaction management,
- APDU protocol management,
- Low level T=0 ; T=1 and T=CL management,
- Error processing,
- Advanced securities activation.

### 2.2.3 Cryptographic library

A dedicated cryptographic library is designed and embedded on the TOE to provide the highest security level and best tuned performances. It provides the following algorithms:

Feature	Embedded
SHA-1, SHA-224, SHA 256, SHA-384 and SHA-512 bits	✓
RSA CRT from 1024, to 2048 bits (by steps of 256 bits)	✓
RSA SFM from 1024 to 2048 bits (by steps of 256 bits)	✓
ECC with key sizes from 192 to 521 bits	✓
3DES with 112 bits key size	✓
AES with 128, 192, 256 key sizes	✓

### 2.2.4 Resident application

This application manages the TOE in pre-personalisation, personalisation and use phase in order to configure the card in the expected way.

It implements and control access to the following services:

- MSK management,
- File management including data reading and writing,
- Key generation,
- Key injection,
- PIN management,
- Locks management.

The resident application can be addressed:

- in clear mode for secure environment or non-sensitive commands,
- using a 3DES secure channel otherwise.

### 2.2.5 LDS application

The Logical Data Structure (LDS) application is a generic filesystem that can be configured to match especially ICAO specifications for ePassports BAC, EAC and SAC and ISO specifications for IDL BAP and EAP.

It also includes commands and protocol management specified in [R15] used to grant access to sensitive data stored in the filesystem.

LDS application provides many features; the evaluation's scope is SAC with AA (Active Authentication).

Feature	Embedded	References
BAC	✓	[R1],[R2], [R3], [R5]
SAC	✓	[R36]
EAC	✓	[R1],[R2], [R3], [R4], [R5]
Active Authentication (RSA CRT/SFM and ECC)	✓	[R1],[R2], [R3], [R5]
Cryptosystem migration (Algorithm change during certificate verification transaction)	✓	R1],[R2], [R3], [R4], [R5]
BAP	✓	[R6], [R7], [R8]
EAP	✓	[R6], [R7], [R8]

### Basic Access Control (BAC)

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 ePassport),
- 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.

## Basic Access Protection (BAP)

The Basic Access Protection (BAP) is especially used in the context of IDL as an alternative to BAC. Indeed it is actually a generalisation of BAC allowing usage of extra algorithms and key length. It exists in 4 modes:

- BAP1 - 3DES with key length of 128 bits (equivalent to BAC),
- BAP2 - AES with key length of 128 bits,
- BAP3 - AES with key length of 192 bits,
- BAP4 - AES with key length of 256 bits.

Following Secure messaging is performed using the algorithm used in the selected BAP mode.

Note that the term MRZ is specific to ICAO standard; [R36] and [R8] uses the term "CAN" and "Keydoc" which refers to an equivalent unique identifier printed on the physical TOE as a random number or barcode.

## Supplemental Access Control (SAC)

The Supplemental Access Control (SAC) is an evolution of the BAC that allows to reach the AVA\_VAN.5 level independently of the entropy password used (MRZ or CAN).

The inspection system

- reads the printed data in the MRZ or CAN,
- authenticates itself as inspection system by means of keys derived from MRZ or CAN data. After successful authentication, the TOE provides read access to data requiring BAC rights by means of a private communication (secure messaging) with the inspection system.

The strength of SAC is linked to the generic mapping function, depending on the MRZ or CAN data, that computes domain in which a Diffie-Hellman key agreement will be performed. In this condition sessions keys generated are totally independant of MRZ or CAN entropy and VAN.5 level can be enforce at all time.

Note that SAC is also known as PACE V2. This name of PACE V2 is used in the following.

## Active Authentication (AA)

The Active Authentication of the TOE is an optional feature that may be implemented. It ensures that the TOE has not been substituted, by means of a challenge-response protocol between the inspection system and the TOE. For this purpose the chip contains its own Active Authentication RSA or ECC Key pair. A hash representation of Data Group 15 (DG15, see 2.5.1) Public Key is stored in the Document Security Object (SOD, see 2.5.1) and therefore authenticated by the issuer's digital signature. The corresponding Private Key is stored in the TOE's secure memory.

The TOE supports the loading and generation of the Active Authentication RSA or ECC Key pair.

## Extended Access Control (EAC)

The Extended Access Control (EAC) enhances the later security features and ensures a strong and mutual authentication of the TOE and the Inspection system. This step is required to access biometric data such as fingerprints and iris stored in DG3 and DG4. In particular, the authentication steps ensures a strong secure channel able to provide confidentiality of the biometric data that are read and authentication of the Inspection system retrieving the date to perform a Match on Terminal comparison. The Extended Access Control authentication steps the TOE implements may be performed either with elliptic curve cryptography, or with RSA cryptography.

## Extended Access Protection (EAP)

The Extended Access Protection (EAP) extends EAC to allow a more flexible protocol. It can protect up to 16 DGs (from 1 to 16) and is no more restricted to DG3 and 4. There is also no prerequisite to

perform A BAP before starting EAP. In addition, it is possible to send more than 2 certificates to the TOE in order to gain extra access rights.

Following secure messaging can be either in 3DES or AES taking into account that if a BAP was previously performed algorithm used must be stronger<sup>3</sup>.

### Feature versus property ensured

	<i>PA</i>	<i>AA</i>	<i>BAC/ BAP</i>	<i>SAC</i>	<i>EAC/EAP</i>	
					<i>CA</i>	<i>TA</i>
Proves that the contents of the data stored in the chip are authentic and unchanged	<b>X</b>	-	-	-	-	-
Prevents from an exact copy and chip substitution	-	<b>X</b>	-	-	<b>X</b>	-
Prevents chip skimming and eavesdropping on the communication between the chip and the Inspection System	-	-	<b>X</b>	<b>X</b>	<b>X</b>	
Prevents unauthorized access to biometric data (fingerprint or iris)	-	-	-	-	-	<b>X</b>
Prevents password recovery (dictionary attacks)	-	-	-	<b>X</b>	-	-

PA: Passive Authentication (enforced by the TOE environment)

AA: Active Authentication

BAC (~ BAP): Basic Access Control

SAC: Supplemental Access Control

EAC (~ EAP): Extended Access Control

CA: Chip Authentication (part of the EAC/EAP)

TA: Terminal Authentication (part of the EAC/EAP)

## 2.3 Chip and software composition

The TOE contains an auto-programmable microcomputer (IC) with non-volatile EEPROM memory, permitting the storing of secret or confidential data, and with associated circuits that ensure its protection. The IC also integrates a ROM memory which embeds the code software of the smartcard.

In order to ensure a secure composition between IC and software, the chip is configured and used according to the security requirements specified in the datasheet and associated guides. This especially specifies the secure way to manage IC memory.

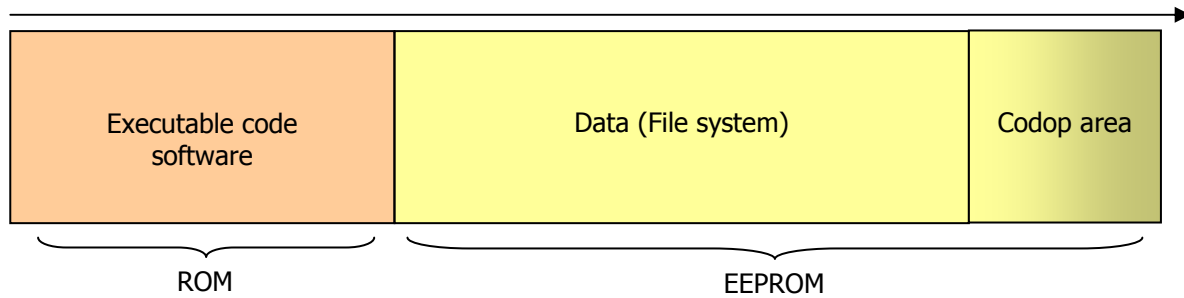
The optional code or "codop" is an executable code that is stored in the EEPROM of the chip. This code is called by the Resident Application when needed. These data are loaded during the pre-personalisation phase after the authentication of the manufacturer. Once an optional code is loaded, it is not possible to load any other optional code whether the TOE is in pre-personalisation phase or personalisation phase. The TOE ensures the optional code's integrity and that it can not be read from the outside.

In order to configure the available features of the product a One-Time Programmable (OTP) area is present (see 2.4). It can be written only once and cannot be erased afterward.

### Memory addresses

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<sup>3</sup> AES 256 is stronger than AES 192 which is stronger than AES 128 which is stronger than 3DES.



**Figure 2** Memory mapping of the TOE

## 2.4 TOE Configurations

The application locks are within a particular area of the EEPROM memory. It is called OTP (One Time Programmable). When the TOE is delivered, all the bits of this area are set to '0'. These bits may be set (to "1") in pre-personalisation phase or personalisation phase after the agent authentication (Manufacturer or Personalizer). Once a bit is set to "1" in this area, it can not be reset anymore. This area is used to select the configuration of the TOE, in particular:

- If the BAC/SAC/BAP is enforced in used phase ('0' = not enforced/'1' = enforced)
- If the EAC is enforced in used phase ('0' = not enforced/'1' = enforced)
- If the EAP is enforced in used phase ('0' = not enforced/'1' = enforced)
- If the Get Data command is disabled ('0' = enabled/'1' = disabled)
- If the Active authentication is activated ('0' = not activated/'1' = activated)
- To indicate the TOE was pre-personalised ('1' = pre-personalised)
- To indicate the TOE was personalised ('1' = personalized)

These OTP bytes are protected in integrity as they are copied in EEPROM too.

Final configuration of the product is set by activating one or several of the five first locks. The product is in use phase when the two last locks are activated. Since BAC is a BAP configuration, the two ones have been merged into a unique lock. Nevertheless, usage of AES keys identifies BAP configuration. The SAC configuration also sharing BAC lock can be identified by checking if EF.CardAccess is present under the MF.

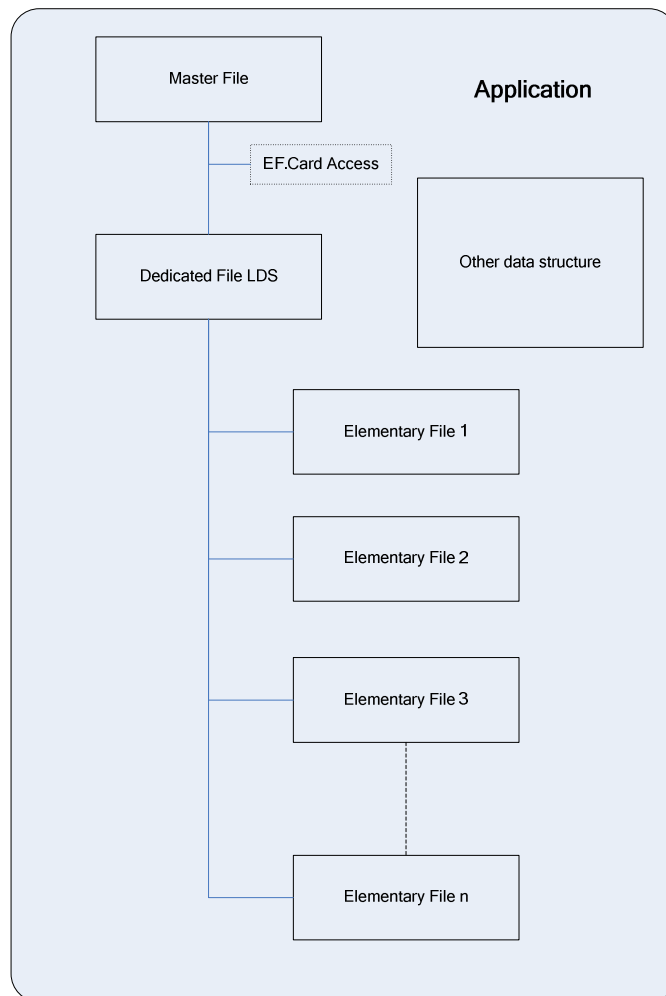
Note that in order to be functional, a correct and consistent personalisation of the TOE must be performed.

## 2.5 TOE logical structure

Roughly, the embedded application, when powered, is seen as a master file, containing a Dedicated file (DF) for the LDS.

This dedicated file is selected by means of the Application Identifier (AID) of the LDS application for example in case of ePassport. Once the application dedicated files are selected, the file structure it contains may be accessed, provided the access conditions are fulfilled.

### 2.5.1 File structure of the TOE



**Figure 3 : Structure of the file system**

The TOE distinguishes between two types of data

- System files,
- Data files that store data that are visible from the outside.

Basically, system files and data files are files handled by the Resident Application. The Resident Application handles their creation and management. Both types have the following characteristics:

- Size, size reserved within the EEPROM for the content of this file,
- EF ID, Elementary File Identifier of the file within the file structure,
- SFI, Short File Identifier used for an easy file selection. It is only used for data files,
- Access conditions, it specifies under which conditions the file may be accessed (read never, read always...).

### 2.5.2 System files

System files are dedicated to store sensitive data that are used by the application. These data are protected in integrity by means of a checksum. These files may be created and updated in pre-personalisation or personalisation phase. Files containing keys are never readable.

Once created, these files are used by the application to work properly. They have to be created before any use of the application.

In particular, these files are used to store:

- The active authentication public key needed to perform the active authentication,
- The active authentication private key needed to perform the active authentication,
- The keys needed to perform BAC, BAP, SAC, EAC and EAP,
- The list of the application present on the card.

### **2.5.3 Data files**

Data files also called Elementary files (EF) or Data Groups (DG) are dedicated to store data that may be retrieved. They are protected in integrity by means of a checksum and can be created or updated either in pre-personalisation or in personalisation phase. They are also created in such a way they can only be read or write in use phase, provided authentications specified in access rights are performed.

All personalisation configurations are possible including BAC, EAC and SAC. Nevertheless, Data Files usually considered are the following:

- EF.COM which describes which DGs are present in the file structure,
- EF.SOD which contains a certificate computed over the whole DGs. It ensures their integrity & authenticity,
- DG1 up to DG24 which contains information about the holder (picture, name...) and key required to perform authentications.

### **2.6 Non evaluated features**

Some features of the product are put out of the evaluation scope and are therefore not part of the TOE. Here is the complete list of those functionalities:

- Standard and biometric PIN management (therefore PIN associated commands are out of scope),



## 2.7 TOE life cycle

The Smart card life-cycle considered hereby, is the one described in [R13]. This protection profile is decomposed into 7 phases, described hereafter, whose only first three ones defined the TOE evaluation scope.

This life cycle is related to the different phases the designer/manufacturer/issuer has to go through to get a smart card ready to use. It starts from the design till the end of usage of the card.

Note that [R10] and [R11] define an alternative lifecycle almost equivalent (phases in [R13] are steps in [R10] and [R11]) except this only difference:

- Step 4 in [R10] and [R11], correspond to phase 4 of [R10] and [R11] and blocks "Micromodule", "testing" and "Embedding" in phase 5 of [R10] and [R11],
- Step 5 in [R10] and [R11] correspond to the only next blocks "Personnalisation" and "Testing" in phase 5 of [R10] and [R11].

It is depicted in the figure below:



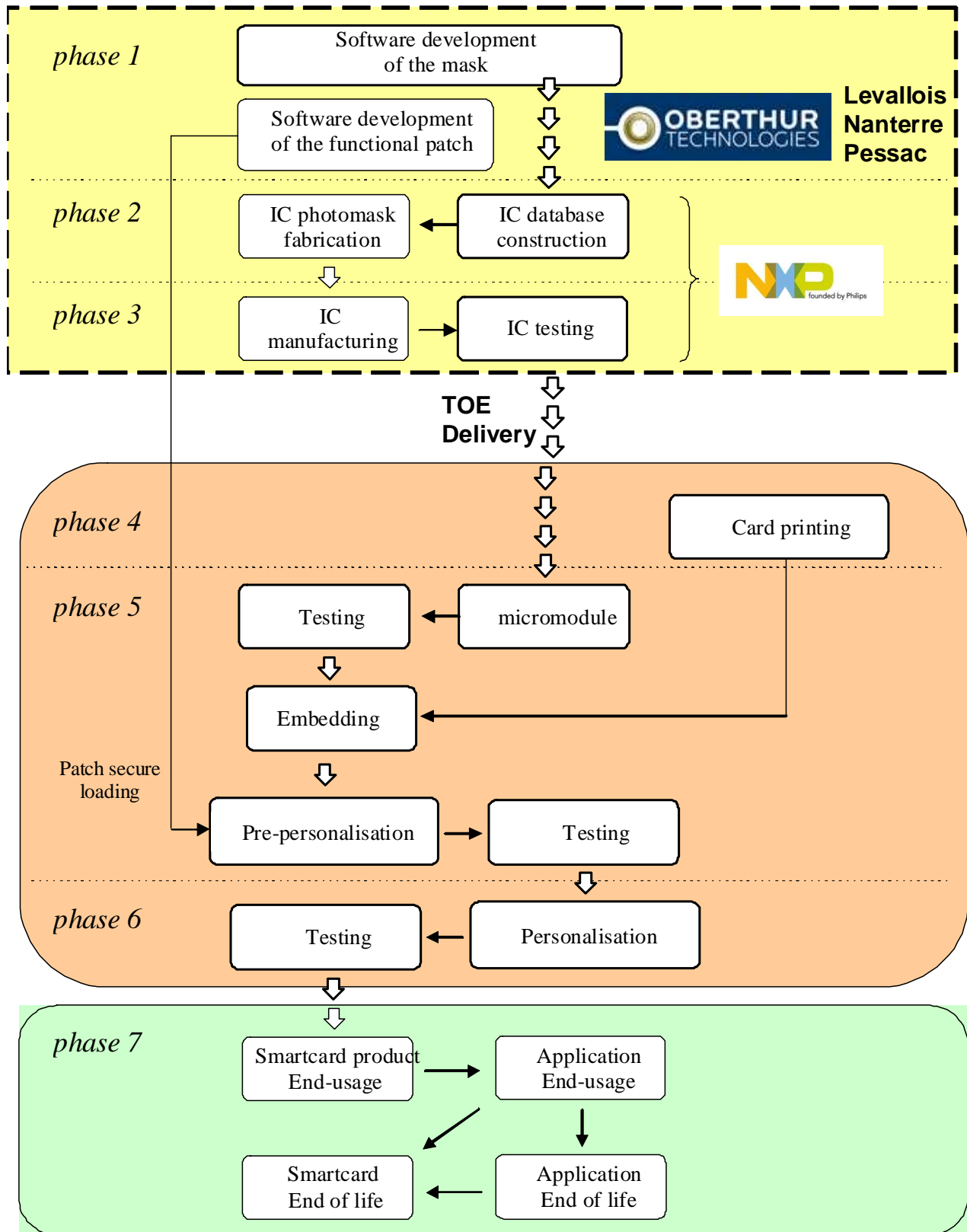


Figure 4 Smartcard product life-cycle for the TOE

Remark: the patch does not impact security; with or without it the TOE remains secure.

## 3 Conformance claims

### 3.1 Common Criteria conformance

This Security Target (ST) is CC Part 2 extended [R35] and CC Part 3 conformant [R36] and written according to the Common Criteria version 3.1 Part 1 [R34].

### 3.2 Package conformance

This ST is conformant to the EAL5 package as defined in [R36].

The EAL5 have been augmented with the following requirements to fulfill the Oberthur Technologies assurance level:

Requirement	Name	Type
ALC_DVS.2	Sufficiency of security measures	Higher hierarchical component
AVA_VAN.5	Advanced methodical vulnerability analysis	Higher hierarchical component

### 3.3 Protection Profile conformance

The Security Target claims strict conformance to the following PP written in CC3.1 revision 3:

- PP "Machine Readable Travel Document SAC (PACE V2) Supplemental Access Control" [R10].

## 4 Security problem definition

### 4.1 Assets

#### Logical MRTD data

The logical MRTD data consists of the EF.COM, EF.DG1 to EF.DG16 (with different security needs), and the Document Security Object EF.SOD according to LDS [R2]. These data are user data of the TOE. The EF.COM lists the existing elementary files (EF) with the user data. The EF.DG1 to EF.DG13 and EF.DG 16 contain personal data of the MRTD holder. The Chip Authentication Public Key (EF.DG 14) is used by the inspection system for the Chip Authentication. The EF.SOD is used by the inspection system for Passive Authentication of the logical MRTD.

The Active Authentication Public Key Info in DG 15 is used by the inspection system for Active Authentication of the chip. The Document security object is used by the inspection system for Passive Authentication of the logical MRTD.

All these data may be sorted out in two different categories.

- o If they are specific to the user, they are User data,
- o If they ensure the correct behaviour of the application, they are TSF Data.

Note that EF.DG3 and 4 (biometric DGs) protection is not enforced by SAC and that those DGs are not assets in the scope of the TOE.

#### User data

CPLC Data	Data uniquely identifying the chip. They are considered as user data as they enable to track the holder
Personnal Data of the MRTD holder (EF.DGx, except EF.DG3, 4 and 15)	Contains identification data of the holder
Document Security Object (SOD) in EF.SOD	Contain a certicate ensuring the integrity of the file stored within the MRTD and their authenticity. It ensures the data are issued by a genuine country
Common data in EF.COM	Declare the data the travel document contains
Active Authentication Public Key in EF.DG15	Contain public data enabling to authenticate the chip thanks to an active authentication

### TSF data

TOE_ID	Data enabling to identify the TOE
Personalisation Agent reference authentication Data	Private key enabling to authenticate the Personalisation agent
PACE V2 access key	Master keys used to established a trusted channel between the Supplemental Inspection System and the travel document
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
Life Cycle State	Life Cycle state of the TOE

### Authenticity of the MRTD's chip

The authenticity of the MRTD's chip personalized by the issuing State or Organization for the MRTD holder is used by the traveler to prove his possession of a genuine MRTD.

## 4.2 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.

### T.Chip\_ID

An attacker trying to trace the movement of the MRTD by identifying remotely the MRTD's chip by establishing or listening to communications through the communication interface. The attacker cannot read and does not know the MRZ data nor the CAN printed on the MRTD data page in advance.

### T.Skimming

An attacker imitates the inspection system to read the logical MRTD or parts of it via the contactless communication channel of the TOE. The attacker cannot read and does not know the MRZ data nor the CAN printed on the MRTD data page in advance.

### T.Eavesdropping

An attacker is listening to an existing communication between the MRTD's chip and an inspection system to gain the logical MRTD or parts of it. The inspection system uses the MRZ data, or the CAN printed on the MRTD data page but the attacker does not know these data in advance.

Note in case of T.Skimming the attacker is establishing a communication with the MRTD's chip not knowing the MRZ data, nor the CAN printed on the the MRTD data page and without a help of the inspection system which knows these data. In case of T.eavesdropping the attacker uses the communication of the inspection system.

## **T.Forgery**

An attacker alters fraudulently the complete stored logical MRTD or any part of it including its security related data in order to deceive on an inspection system by means of the changed MRTD holder's identity or biometric reference data.

This threat comprises several attack scenarios of MRTD forgery. The attacker may alter the biographical data on the biographical data page of the passport book, in the printed MRZ and in the digital MRZ to claim another identity of the traveler. The attacker may alter the printed portrait and the digitized portrait to overcome the visual inspection of the inspection officer and the automated biometric authentication mechanism by face recognition. The attacker may alter the biometric reference data to defeat automated biometric authentication mechanism of the inspection system. The attacker may combine data groups of different logical MRTDs to create a new forged MRTD, e.g. the attacker writes the digitized portrait and optional biometric reference finger data read from the logical MRTD of a traveler into another MRTD's chip leaving their digital MRZ unchanged to claim the identity of the holder this MRTD. The attacker may also copy the complete unchanged logical MRTD to another contactless chip.

## **T.Abuse-Func**

An attacker may use functions of the TOE which shall not be used in the phase "Operational Use" in order (i) to manipulate User Data, (ii) to manipulate (explore, bypass, deactivate or change) security features or functions of the TOE or (iii) to disclose or to manipulate TSF Data.

This threat addresses the misuse of the functions for the initialization and the personalization in the operational environment after delivery to MRTD holder.

## **T.Information\_Leakage**

An attacker may exploit information which is leaked from the TOE during its usage in order to disclose confidential TSF data. The information leakage may be inherent in the normal operation or caused by the attacker.

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 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 the Differential Electromagnetic Analysis (DEMA) and the 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**

An attacker may perform physical probing of the MRTD's chip in order (i) to disclose TSF Data or (ii) to disclose/reconstruct the MRTD's chip Embedded Software. An attacker may physically modify the MRTD's chip in order to (i) modify security features or functions of the MRTD's chip, (ii) modify security functions of the MRTD's chip Embedded Software, (iii) modify User Data or (iv) to modify TSF data.

The physical tampering may be focused directly on the disclosure or manipulation of TOE User Data (e.g. the biometric reference data for the inspection system) or TSF Data (e.g. authentication key of the MRTD's chip) 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 direct interaction with the MRTD's chip internals. Techniques commonly employed in IC failure analysis and IC reverse engineering efforts may be used. Before that, the hardware security mechanisms and layout characteristics need to be identified. Determination of software design including treatment of User Data and TSF Data may also be a pre-requisite. The modification may result in the deactivation of a security function. Changes of circuitry or data can be permanent or temporary.

### **T.Malfunction**

An attacker may cause a malfunction of TSF or of the MRTD's chip Embedded Software by applying environmental stress in order to (i) deactivate or modify security features or functions of the TOE or (ii) circumvent, deactivate or modify security functions of the MRTD's chip Embedded Software.

This may be achieved e.g. by operating the MRTD's chip outside the normal operating conditions, exploiting errors in the MRTD's chip Embedded Software or misusing administration function. To exploit these vulnerabilities an attacker needs information about the functional operation.

### **T.Counterfeit**

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.

## **4.3 Organisational Security Policies**

### **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.Personalization**

The issuing State or Organization guarantees the correctness of the biographical data, the printed portrait and the digitized portrait, the biometric reference data and other data of the logical MRTD with respect to the MRTD holder. The personalization of the MRTD for the holder is performed by an agent authorized by the issuing State or Organization only.

### **P.Personal\_Data**

The biographical data and their summary printed in the MRZ and stored on the MRTD's chip (EF.DG1), the printed portrait and the digitized portrait (EF.DG2), the biometric reference data of finger(s) (EF.DG3), the biometric reference data of iris image(s) (EF.DG4) and data according to LDS (EF.DG5 to EF.DG13, EF.DG16) stored on the MRTD's chip are personal data of the MRTD holder. These data groups are intended to be used only with agreement of the MRTD holder by inspection systems to which the MRTD is presented. The MRTD's chip shall provide the possibility for the PACE V2 Access Control to allow read access to these data only for terminals successfully authenticated based on knowledge of the Document PACE V2 Access Keys as defined in [R36].

### **P.Sensitive\_Data\_Protection**

All the sensitive data are at least protected in integrity. The keys are protected in both integrity and confidentiality.

### **P.Key\_Function**

All the cryptographic routines are designed in such a way that they are protected against probing and do not cause any information leakage that may be used by an attacker.

## **4.4 Assumptions**

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

### **A.MRTD\_Manufact**

It is assumed that appropriate functionality testing of the MRTD is used. It is assumed that security procedures are used during all manufacturing and test operations to maintain confidentiality and integrity of the MRTD and of its manufacturing and test data (to prevent any possible copy, modification, retention, theft or unauthorized use).

### **A.MRTD\_Delivery**

Procedures shall guarantee the control of the TOE delivery and storage process and conformance to its objectives:

- o Procedures shall ensure protection of TOE material/information under delivery and storage.
- o Procedures shall ensure that corrective actions are taken in case of improper operation in the delivery process and storage.
- o Procedures shall ensure that people dealing with the procedure for delivery have got the required skill.

### **A.Pers\_Agent**

The Personalization Agent ensures the correctness of (i) the logical MRTD with respect to the MRTD holder, (ii) the Document PACE V2 Access Keys derived from the MRZ or the CAN, (iii) the Chip Authentication Public Key (EF.DG14) if stored on the MRTD's chip, and (iv) the Document Signer Public Key Certificate (if stored on the MRTD's chip). The Personalization Agent signs the Document Security Object. The Personalization Agent bears the Personalization Agent Authentication to authenticate himself to the TOE by symmetric cryptographic mechanisms.

### **A.Insp\_Sys**

The Inspection System is 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. The Supplemental Inspection System for global interoperability (i) includes the Country Signing Public Key and the Document Signer Public Key of each issuing State or Organization, and (ii) implements the terminal part of the PACE V2 Access Control [R36]. The Supplemental Inspection System reads the logical MRTD under PACE V2 Access Control and performs the Passive Authentication to verify the logical MRTD.



## 5 Security Objectives

### 5.1 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.

#### **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 [R2] 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.

#### **OT.Data\_Int**

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 that the inspection system is able to detect any modification of the transmitted logical MRTD data.

#### **OT.Data\_Conf**

The TOE must ensure the confidentiality of the logical MRTD data groups EF.DG1 to EF.DG16. Read access to EF.DG1 to EF.DG16 is granted to terminals successfully authenticated as Personalization Agent. Read access to EF.DG1, EF.DG2 and EF.DG5 to EF.DG16 is granted to terminals successfully authenticated as Supplemental Inspection System. The Supplemental Inspection System shall authenticate itself by means of the PACE V2 Access Control based on knowledge of the Document Basic Access Key. The TOE must ensure the confidentiality of the logical MRTD data during their transmission to the Supplemental Inspection System.

#### **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 Authentication Key(s). In Phase 4 "Operational Use" the TOE shall identify itself only to a successful authenticated Supplemental Inspection System or Personalization Agent.

#### **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 or (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

- o 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
- o by forcing a malfunction of the TOE and/or
- o 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 high attack potential by means of

- o 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
- o 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)
- o manipulation of the hardware and its security features, as well as
- o controlled manipulation of memory contents (User Data, TSF Data)

with a prior

- o 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.Chip\_Authenticity**

The TOE must support the Inspection Systems to verify the authenticity of the MRTD's chip. The TOE stores a RSA or ECC private key to prove its identity, and that is used in chip authentication. This mechanism is described in [R1] as "Active Authentication".

## **5.2 Security objectives for the Operational Environment**

### **5.2.1 Issuing State or Organization**

The issuing State or Organization will implement the following security objectives of the TOE environment.

### **OE.MRTD\_Manufact**

Appropriate functionality testing of the TOE shall be used in step 4 to 6.

During all manufacturing and test operations, security procedures shall be used through phases 4, 5 and 6 to maintain confidentiality and integrity of the TOE and its manufacturing and test data.

### **OE.MRTD\_Delivery**

Procedures shall ensure protection of TOE material/information under delivery including the following objectives:

- o non-disclosure of any security relevant information,
- o identification of the element under delivery,
- o meet confidentiality rules (confidentiality level, transmittal form, reception acknowledgment),
- o physical protection to prevent external damage,
- o secure storage and handling procedures (including rejected TOE's),
- o traceability of TOE during delivery including the following parameters:
  - origin and shipment details,
  - reception, reception acknowledgement,
  - location material/information.

Procedures shall ensure that corrective actions are taken in case of improper operation in the delivery process (including if applicable any non-conformance to the confidentiality convention) and highlight all non-conformance to this process.

Procedures shall ensure that people (shipping department, carrier, reception department) dealing with the procedure for delivery have got the required skill, training and knowledge to meet the procedure requirements and be able to act fully in accordance with the above expectations.

### **OE.Personalization**

The issuing State or Organization must ensure that the Personalization Agents acting on behalf of the issuing State or Organization (i) establish the correct identity of the holder and create biographical data for the MRTD, (ii) enroll the biometric reference data of the MRTD holder i.e. the portrait, the encoded finger image(s) and/or the encoded iris image(s) and (iii) personalize the MRTD for the holder together with the defined physical and logical security measures to protect the confidentiality and integrity of these data.

### **OE.Pass\_Auth\_Sign**

The issuing State or Organization must (i) generate a cryptographic secure Country Signing CA Key Pair, (ii) ensure the secrecy of the Country Signing CA Private Key and sign Document Signer Certificates in a secure operational environment, and (iii) distribute the Certificate of the Country Signing CA Public Key to receiving States and Organizations maintaining its authenticity and integrity. The issuing State or Organization must (i) generate a cryptographic secure Document Signer Key Pair and ensure the secrecy of the Document Signer Private Keys, (ii) sign Document Security Objects of genuine MRTD in a secure operational environment only and (iii) distribute the Certificate of the Document Signer Public Key to receiving States and Organizations. The digital signature in the Document Security Object relates all data in the data in EF.DG1 to EF.DG16 if stored in the LDS according to [R2].

### **5.2.2 Receiving State or Organization**

The receiving State or Organization will implement the following security objectives of the TOE environment.

#### **OE.Exam\_MRTD**

The inspection system of the receiving State or Organization must examine the MRTD presented by the traveler to verify its authenticity by means of the physical security measures and to detect any manipulation of the physical MRTD. The Supplemental Inspection System for global interoperability (i) includes the Country Signing Public Key and the Document Signer Public Key of each issuing State or Organization, and (ii) implements the terminal part of the PACE V2 Access Control [R36].

#### **OE.Passive\_Auth\_Verif**

The border control officer of the receiving State uses the inspection system to verify the traveler as MRTD holder. The inspection systems must have successfully verified the signature of Document Security Objects and the integrity data elements of the logical MRTD before they are used. The receiving States and Organizations must manage the Country Signing Public Key and the Document Signer Public Key maintaining their authenticity and availability in all inspection systems.

#### **OE.Prot\_Logical\_MRTD**

The inspection system of the receiving State or Organization ensures the confidentiality and integrity of the data read from the logical MRTD. The receiving State examining the logical MRTD being under PACE V2 Access Control will use inspection systems which implement the terminal part of the PACE V2 Access Control and use the secure messaging with fresh generated keys for the protection of the transmitted data (i.e. Supplemental Inspection Systems).

## 6 Extended requirements

### 6.1 Extended families

#### 6.1.1 Extended family FAU\_SAS - Audit data storage

##### Description

see [R10].

##### Extended components

###### Extended component FAU\_SAS.1

##### *Description*

see [R10].

##### *Definition*

#### **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 [R10].

##### **Rationale**

see [R10].

#### 6.1.2 Extended family FCS\_RND - Generation of random numbers

##### Description

see [R10].

##### Extended components

###### Extended component FCS\_RND.1

##### *Description*

See [R10].

*Definition*

**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 [R10].

**Rationale**

see [R10].

**6.1.3 Extended family FMT\_LIM - Limited capabilities and availability**

**Description**

See [R10].

**Extended components**

**Extended component FMT\_LIM.1**

*Description*

See [R10].

*Definition*

**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 [R10].

**Extended component FMT\_LIM.2**

*Description*

See [R10].

*Definition***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 [R10].

**Rationale**

See [R10].

**6.1.4 Extended family FPT\_EMS - TOE Emanation****Description**

See [R10].

**Extended components****Extended component FPT\_EMS.1***Description*

See [R10].

*Definition***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 [R10].

**Rationale**

See [R10].



## 7 Security Functional Requirements

### 7.1 Security Functional Requirements

#### 7.1.1 PP SAC

##### FAU\_SAS.1 Audit storage

**FAU\_SAS.1.1** The TSF shall provide **the Manufacturer** with the capability to store **the IC Identification Data** in the audit records.

##### FCS\_CKM.1 Cryptographic key generation

**FCS\_CKM.1.1** The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **Document PACE V2 Access Key Derivation Algorithm** and specified cryptographic key sizes **112 bits (for Triple-DES) and 128,192, 256 (for AES)** that meet the following: **[R36], normative appendix 5.**

##### FCS\_CKM.4 Cryptographic key destruction

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

##### FCS\_COP.1/SHA Cryptographic operation

**FCS\_COP.1.1/SHA** The TSF shall perform **hashing** in accordance with a specified cryptographic algorithm **SHA-1 and SHA-256** and cryptographic key sizes **none** that meet the following: **FIPS 180-2.**

##### FCS\_COP.1/ENC Cryptographic operation

**FCS\_COP.1.1/ENC** The TSF shall perform **secure messaging (PACE V2) - encryption and decryption**

in accordance with a specified cryptographic algorithm **Triple-DES in CBC mode and AES** and cryptographic key sizes **112 bits (for Triple-DES) and 128,192, 256 (for AES)** that meet the following: **FIPS 46-3 [R27] and [R5] normative appendix 5, A5.3.**

### FCS\_COP.1/AUTH Cryptographic operation

**FCS\_COP.1.1/AUTH** The TSF shall perform **symmetric authentication, encryption and decryption** in accordance with a specified cryptographic algorithm **Triple-DES and AES** and cryptographic key sizes **112(for Triple DES) and 128, 192, 256 (for AES)** that meet the following: **FIPS 46-3 [R27] and FIPS 197 [R30]**.

### FCS\_COP.1/MAC Cryptographic operation

**FCS\_COP.1.1/MAC** The TSF shall perform **secure messaging - message authentication code** in accordance with a specified cryptographic algorithm **3DES in Retail mode and AES in CMAC-mode** and cryptographic key sizes **112(for Triple DES) and 128, 192, 256 (for AES)** that meet the following: **ISO 9797 (MAC algorithm 3, block cipher DES, Sequence Message Counter, padding mode 2) and NIST Special publication 800-38B**.

### FCS\_RND.1 Quality metric for random numbers

**FCS\_RND.1.1** The TSF shall provide a mechanism to generate random numbers that meet the requirement to provide an entropy of at least **7.976 bits in each byte, following AIS 31 [R31]**.

### FIA\_AFL.1 Authentication failure handling

**FIA\_AFL.1.1** 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 **PACE V2 authentication protocol**.

**FIA\_AFL.1.2 [Editorially Refined]** When the defined number of unsuccessful authentication attempts has been **met or surpassed**, the TSF shall **wait for an increasing time between receiving of the terminal challenge and sending of the TSF response during the PACE V2 authentication attempts**.

### FIA\_UID.1 Timing of identification

**FIA\_UID.1.1** The TSF shall allow

- **1. to read the Initialization Data in Phase 2 "Manufacturing",**
- **2. to read the random identifier and the file CardAccess in Phase 3 "Personalization of the MRTD",**
- **3. to read the random identifier and the file CardAccess in Phase 4 "Operational Use"**

on behalf of the user to be performed before the user is identified.

**FIA\_UID.1.2** The TSF shall require each user to be successfully identified before allowing any other TSF-mediated actions on behalf of that user.

#### **FIA\_UAU.1 Timing of authentication**

**FIA\_UAU.1.1** The TSF shall allow

- **1. to read the Initialization Data in Phase 2 "Manufacturing",**
- **2. to read the random identifier and the file CardAccess in Phase 3 "Personalization of the MRTD",**
- **3. to read the random identifier and the file CardAccess in Phase 4 "Operational Use"**

on behalf of the user to be performed before the user is authenticated.

**FIA\_UAU.1.2** 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 Single-use authentication mechanisms**

**FIA\_UAU.4.1** The TSF shall prevent reuse of authentication data related to

- **1. PACE V2 Access Control Authentication Mechanism,**
- **2. Authentication Mechanisms based on Triple-DES and AES.**

#### **FIA\_UAU.5 Multiple authentication mechanisms**

**FIA\_UAU.5.1** The TSF shall provide

- **1. PACE V2 Access Control Authentication Mechanism**
- **2. Symmetric Authentication Mechanism based on Triple-DES and AES**

to support user authentication.

**FIA\_UAU.5.2** The TSF shall authenticate any user's claimed identity according to the

- **1. The TOE accepts the authentication attempt as Personalization Agent by one of the following mechanism(s):**
  - **the Symmetric Authentication Mechanism with the Personalization Agent Key,**
- **2. The TOE accepts the authentication attempt as Supplemental Inspection System only by means of the PACE V2 Access Control Authentication Mechanism with the Document PACE V2 Access Keys .**

**FIA\_UAU.6 Re-authenticating**

**FIA\_UAU.6.1** The TSF shall re-authenticate the user under the conditions: **Failure of MAC verification in a command received by the TOE .**

**FDP\_ACC.1 Subset access control**

**FDP\_ACC.1.1** The TSF shall enforce the **PACE V2 Access Control SFP** on **terminals gaining write, read and modification access to data in the EF.COM, EF.SOD, EF.DG1 to EF.DG16 and Active Authentication private key of the logical MRTD.**

**FDP\_ACF.1 Security attribute based access control**

**FDP\_ACF.1.1** The TSF shall enforce the **PACE V2 Access Control SFP** to objects based on the following:

- o **1. Subjects:**
  - **a. Personalization Agent,**
  - **b. Supplemental Inspection System,**
  - **c. Terminal,**
- o **2. Objects:**
  - **a. data EF.DG1 to EF.DG16 of the logical MRTD,**
  - **b. data in EF.COM,**
  - **c. data in EF.SOD,**
  - **d. Active Authentication public key,**
- o **3. Security attributes**
  - **a. authentication status of terminals.**

**FDP\_ACF.1.2** The TSF shall enforce the following rules to determine if an operation among controlled subjects and controlled objects is allowed:

- o **1. the successfully authenticated Personalization Agent is allowed to write and to read the data of the EF.COM, EF.SOD, EF.DG1 to EF.DG16 of the logical MRTD, including the Active Authenticate public Key,**
- o **2. the successfully authenticated Supplemental Inspection System is allowed to read the data in EF.COM, EF.SOD, EF.DG1, EF.DG2 and EF.DG5 to EF.DG16 of the logical MRTD, including the Active Authenticate public Key.**

**FDP\_ACF.1.3** The TSF shall explicitly authorise access of subjects to objects based on the following additional rules: **none**.

**FDP\_ACF.1.4** The TSF shall explicitly deny access of subjects to objects based on the following additional rules:

- **1. Any terminal is not allowed to modify any of the EF.DG1 to EF.DG16 of the logical MRTD,**
- **2. Any terminal is not allowed to read any of the EF.DG1 to EF.DG16 of the logical MRTD,**
- **3. The Supplemental Inspection System is not allowed to read the data in EF.DG3 and EF.DG4.**

#### **FDP\_UCT.1 Basic data exchange confidentiality**

**FDP\_UCT.1.1** The TSF shall enforce the **PACE V2 Access Control SFP** to **transmit and receive** user data in a manner protected from unauthorised disclosure.

#### **FDP\_UIT.1 Data exchange integrity**

**FDP\_UIT.1.1** The TSF shall enforce the **PACE V2 Access Control SFP** to **transmit and receive** user data in a manner protected from **modification, deletion, insertion and replay** errors.

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

#### **FMT\_SMF.1 Specification of Management Functions**

**FMT\_SMF.1.1** The TSF shall be capable of performing the following management functions:

- **1. Initialization,**
- **2. Personalization,**
- **3. Configuration.**

#### **FMT\_SMR.1 Security roles**

**FMT\_SMR.1.1** The TSF shall maintain the roles

- **1. Manufacturer,**
- **2. Personalization Agent,**
- **3. Supplemental Inspection System.**

**FMT\_SMR.1.2** The TSF shall be able to associate users with roles.

#### **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:

**Deploying Test Features after TOE Delivery does not allow**

- o **1. User Data to be disclosed or manipulated,**
- o **2. TSF data to be disclosed or manipulated,**
- o **3. software to be reconstructed and,**
- o **4. substantial information about construction of TSF to be gathered which may enable other attacks.**

#### **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:

**Deploying Test Features after TOE Delivery does not allow**

- o **1. User Data to be disclosed or manipulated,**
- o **2. TSF data to be disclosed or manipulated,**
- o **3. software to be reconstructed and,**
- o **4. substantial information about construction of TSF to be gathered which may enable other attacks.**

#### **FMT\_MTD.1/INI\_ENA Management of TSF data**

**FMT\_MTD.1.1/INI\_ENA** The TSF shall restrict the ability to **write** the **the Initialization Data and Pre-personalization Data** to **the Manufacturer**.

#### **FMT\_MTD.1/INI\_DIS Management of TSF data**

**FMT\_MTD.1.1/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/KEY\_WRITE Management of TSF data**

**FMT\_MTD.1.1/KEY\_WRITE** The TSF shall restrict the ability to **write** the **Document PACE V2 Access Keys** and **Active Authentication private key** to **Personalization Agent**.

#### FMT\_MTD.1/KEY\_READ Management of TSF data

**FMT\_MTD.1.1/KEY\_READ** The TSF shall restrict the ability to **read** the **Document PACE V2 Access Keys , Personalisation Agent keys and Active Authentication private key** to **none**.

#### FPT\_EMS.1 TOE Emanation

**FPT\_EMS.1.1** The TOE shall not emit **power variations, timing variations during command execution** in excess of **non useful information** enabling access to **Personalization Agent Authentication Keys** and **Active Authentication private key**.

**FPT\_EMS.1.2** The TSF shall ensure **any unauthorized users** are unable to use the following interface **smart card circuit contacts** to gain access to **Personalization Agent Authentication Keys** and **Active Authentication private key**.

#### FPT\_FLS.1 Failure with preservation of secure state

**FPT\_FLS.1.1** The TSF shall preserve a secure state when the following types of failures occur:

- o **1. Exposure to out-of-range operating conditions where therefore a malfunction could occur,**
- o **2. failure detected by TSF according to FPT\_TST.1.**

#### FPT\_TST.1 TSF testing

**FPT\_TST.1.1** The TSF shall run a suite of self tests **at the conditions**

- o **At reset**
- o **Before the first execution of the optional code,**
- o **After the Active Authentication is computed,**
- o **Before any cryptographic operation,**
- o **When accessing a DG,**
- o **Prior to any use of TSF data,**
- o **Before execution of any command,**
- o **When performing a PACE V2 authentication,**

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

**FPT\_TST.1.2** The TSF shall provide authorised users with the capability to verify the integrity of **TSF data**.

**FPT\_TST.1.3** The TSF shall provide authorised users with the capability to verify the integrity of **TSF executable code**.

### **FPT\_PHP.3 Resistance to physical attack**

**FPT\_PHP.3.1** The TSF shall resist **physical manipulation and physical probing** to the TSF by responding automatically such that the SFRs are always enforced.

#### **7.1.2 Active Authentication (AA)**

### **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.

### **FCS\_COP.1/SIG\_MRTD Cryptographic operation**

**FCS\_COP.1.1/SIG\_MRTD** The TSF shall perform **digital signature creation** in accordance with a specified cryptographic algorithm **RSA CRT, RSA SFM or ECDSA with SHA1, SHA-224, SHA-256, SHA-384 or SHA-512** and cryptographic key sizes

- o **1024 to 2048 bits for RSA (by steps of 256bits),**
- o **192 to 521 bits for ECDSA,**

that meet the following:

- o **scheme 1 of [R20] for RSA,**
- o **[R17], [R18], [R19] for ECC.**



### FDP\_ITC.1/AA Import of user data without security attributes

**FDP\_ITC.1.1/AA** The TSF shall enforce the **PACE V2 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\_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**.

### FCS\_CKM.1/ASYM Cryptographic key generation

**FCS\_CKM.1.1/ASYM** The TSF shall generate cryptographic keys in accordance with a specified cryptographic key generation algorithm **RSA & ECC** and specified cryptographic key sizes

- o **1024 to 2048 bits for RSA (by steps of 256 bits),**
- o **192 to 521 bits over characteristic p curves for ECC**

that meet the following: [R20], [R21], [R22], [R23].

## 7.2 Security Assurance Requirements

The security assurance requirement level is EAL5 augmented with ALC\_DVS.2 and AVA\_VAN.5.

## 8 TOE Summary Specification

### 8.1 TOE Summary Specification

#### Access Control in reading

This function controls access to read functions (in EEPROM) 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:

- o PACE V2 keys
- o Active Authentication private key
- o Personalisation agent keys

It controls access to the CPLC data as well:

- o It ensures the CPLC data can be read during the personalization phase
- o It ensures it can not be readable in free mode at the end of the personalization step

Regarding the file structure:

In the operational use:

- o The terminal can read user data, the Document Security Object, EF.COM only after PACE V2 authentication and through a valid secure channel.

In the personalisation phase

- o The personalisation agent can read all the data stored in the TOE after it is authenticated by the TOE (using its authentication keys).
- o The TOE is uniquely identified by a random number, generated at each reset. This unique identifier is called (PUPI)

It ensures as well that no other part of the EEPROM 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.

This security functionality ensures the application locks can only be written once in personalization phase to be set to "1".

It ensures as well the CPLC data can not be written anymore once the TOE is personalized and that it is not possible to load an optional code or change the personaliser authentication keys in personalization phase.

Regarding the file structure

In the operational use: It is not possible to create any files (system or data files). Furthermore, it is not possible to update any system files. However

- o the application data is still accessed internally by the application for its own needs

In the personalisation phase

- o The personalisation 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).

### **PACE V2 mechanism**

This security functionality ensures the PACE V2 is correctly performed. It can only be performed once the TOE is personalized with the symmetric PACE V2 keys the Personalization Agent loaded beforehand during the personalization phase. Furthermore, this security functionality ensures the session keys are destroyed at the beginning of each PACE V2 session. A self-test on TDES and random generator is performed when a PACE V2 session is requested.

### **Secure Messaging**

This security functionality ensures the confidentiality & integrity of the channel the TOE and the IFD are using to communicate. After a successful PACE V2 authentication, a secure channel is established based on Triple DES algorithms. This security functionality ensures

- o No commands were inserted nor deleted within the data flow
- o No commands were modified
- o The data exchanged remain confidential
- o The issuer of the incoming commands and the destinatory of the outgoing data is the one that was authenticated (through PACE V2)

If an error occurs in the secure messaging layer, the session keys are destroyed

### **Personalisation Agent Authentication**

This security functionality ensures the TOE, when delivered to the Personalization 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.

### **Active Authentication**

This security functionality ensures the Active Authentication is performed as described in [R1] & [R2]. (if it is activated by the personalizer). A self-test on the random generator is performed prior to any Active authentication. Moreover, this security functionality is protected against the DFA.

### **Self tests**

The TOE performs self tests on the TSF data it stores to protect the TOE. In particular, it is in charge of the:

- o DFA detection for the Active authentication
- o Self tests of the random generator before the PACE V2 and Active Authentication
- o Self tests of the DES before the PACE V2 Monitoring of the integrity of keys, files and TSF data Monitoring the integrity of the optional code (at start up) Protecting the cryptographic operation

The integrity of the files are monitored each time they are accessed and the integrity of the optional code is checked each time the TOE is powered on. The integrity of keys and sensitive data is checked each time they are used/accessed.

### **Safe state management**

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

- o an integrity error is detected by F.SELFTESTS
- o 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.

### **Physical protection**

This security functionality protects the TOE against physical attacks.

## 9 Rationales

### 9.1 Security objectives and Security Problem Definition

#### 9.1.1 Threats

**T.Chip\_ID** The threat T.Chip\_ID "Identification of MRTD's chip" addresses the trace of the MRTD movement by identifying remotely the MRTD's chip through the contactless communication interface. This threat is countered as described by the security objective OT.Identification by PACE V2 Access Control.

**T.Skimming** The threat T.Skimming "Skimming digital MRZ data or the digital portrait" addresses the reading of the logical MRTD through the interface or listening the communication between the MRTD's chip and a terminal. This threat is countered by the security objective OT.Data\_Conf "Confidentiality of personal data" through PACE V2 Access Control.

**T.Eavesdropping** The threat T.Eavesdropping "Eavesdropping to the communication between TOE and inspection system" addresses the reading of the logical MRTD through the interface or listening the communication between the MRTD's chip and a terminal. This threat is countered by the security objective OT.Data\_Conf "Confidentiality of personal data" through PACE V2 Access Control.

**T.Forgery** The threat T.Forgery "Forgery of data on MRTD's chip" addresses the fraudulent alteration of the complete stored logical MRTD or any part of it. The security objective OT.AC\_Pers "Access Control for Personalization of logical MRTD" requires the TOE to limit the write access for the logical MRTD to the trustworthy Personalization Agent (cf. OE.Personalization). The TOE will protect the integrity of the stored logical MRTD according to the security objective OT.Data\_Int "Integrity of personal data" and OT.Prot\_Phys-Tamper "Protection against Physical Tampering". The examination of the presented MRTD passport book according to OE.Exam\_MRTD "Examination of the MRTD passport book" shall ensure that passport book does not contain a sensitive chip which may present the complete unchanged logical MRTD. The TOE environment will detect partly forged logical MRTD data by means of digital signature which will be created according to OE.Pass\_Auth\_Sign "Authentication of logical MRTD by Signature" and verified by the inspection system according to OE.Passive\_Auth\_Verif "Verification by Passive Authentication".

**T.Abuse-Func** The threat T.Abuse-Func "Abuse of Functionality" addresses attacks using the MRTD's chip as production material for the MRTD and misuse of the functions for personalization in the operational state after delivery to MRTD holder to disclose or to manipulate the logical MRTD. This threat is countered by OT.Prot\_Abuse-Func "Protection against Abuse of Functionality". Additionally this objective is supported by the security objective for the TOE environment: OE.Personalization "Personalization of logical MRTD" ensuring that the TOE security functions for the initialization and the personalization are disabled and the security functions for the operational state after delivery to MRTD holder are enabled according to the intended use of the TOE.

**T.Information\_Leakage** The threat T.Information\_Leakage "Information Leakage from MRTD's chip" is typical for integrated circuits like smart cards under direct attack with high attack potential. The protection of the TOE against this threat is addressed by the directly related security objective OT.Prot\_Inf\_Leak "Protection against Information Leakage".

**T.Phys-Tamper** The threat T.Phys-Tamper "Physical Tampering" is typical for integrated circuits like smart cards under direct attack with high attack potential. The protection of the TOE against this threat is addressed by the directly related security objective OT.Prot\_Phys-Tamper "Protection against Physical Tampering".

**T.Malfunction** The threat T.Malfunction "Malfunction due to EnvironmentalStress" is typical for integrated circuits like smart cards under direct attack with high attack potential. The protection of the TOE against this threat is addressed by the directly related security objective OT.Prot\_Malfunction "Protection against Malfunctions".

**T.Counterfeit** The threat T.Counterfeit "MRTD's chip" addresses the attack of unauthorized copy or reproduction of the genuine MRTD chip. This attack is thwarted by active authentication proving the authenticity of the chip as required by OT.Chip\_Authenticity "Protection against forgery" using a authentication key pair to be generated by the issuing State or Organization. The Public active Authentication Key has to be written into EF.DG15 and signed by means of Documents Security Objects.

### 9.1.2 Organisational Security Policies

**P.Manufact** The OSP P.Manufact "Manufacturing of the MRTD's chip" requires a unique identification of the IC by means of the Initialization Data and the writing of the Pre-personalization Data as being fulfilled by OT.Identification.

**P.Personalization** The OSP P.Personalization "Personalization of the MRTD by issuing State or Organization only" addresses the (i) the enrolment of the logical MRTD by the Personalization Agent as described in the security objective for the TOE environment OE.Personalization "Personalization of logical MRTD", and (ii) the access control for the user data and TSF data as described by the security objective OT.AC\_Pers "Access Control for Personalization of logical MRTD". Note the manufacturer equips the TOE with the Personalization Agent Key(s) according to OT.Identification "Identification and Authentication of the TOE". The security objective OT.AC\_Pers limits the management of TSF data and management of TSF to the Personalization Agent.

**P.Personal\_Data** The OSP P.Personal\_Data "Personal data protection policy" requires the TOE (i) to support the protection of the confidentiality of the logical MRTD by means of the PACE V2 Access Control and (ii) enforce the access control for reading as decided by the issuing State or Organization. This policy is implemented by the security objectives OT.Data\_Int "Integrity of personal data" describing the unconditional protection of the integrity of the stored data and during transmission. The security objective OT.Data\_Conf "Confidentiality of personal data" describes the protection of the confidentiality.

**P.Sensitive\_Data\_Protection** The OSP P.Sensitive\_data\_Protection requires data to be protected in integrity as fulfilled by OT.Data\_Int. Concerning keys, they must be protected in confidentiality in any cases as ensured by OT.Prot\_Inf\_Leak.

**P.Key\_Function** The OSP P.Key\_function requires cryptographic algorithms to be protected against tampering as it enforced for the whole TOE by OT.Prot\_Phys-Tamper and also designed in order to avoid data leakage as ensured by OT.Prot\_Inf\_Leak.

### 9.1.3 Assumptions

**A.MRTD\_Manufact** The assumption A.MRTD\_Manufact "MRTD manufacturing on step 4 to 6" is covered by the security objective for the TOE environment OE.MRTD\_Manufact "Protection of the MRTD Manufacturing" that requires to use security procedures during all manufacturing steps.

**A.MRTD\_Delivery** The assumption A.MRTD\_Delivery "MRTD delivery during step 4 to 6" is covered by the security objective for the TOE environment OE.MRTD\_Delivery "Protection of the MRTD delivery" that requires to use security procedures during delivery steps of the MRTD.

**A.Pers\_Agent** The assumption A.Pers\_Agent "Personalization of the MRTD's chip" is covered by the security objective for the TOE environment OE.Personalization "Personalization of logical MRTD" including the enrolment, the protection with digital signature and the storage of the MRTD holder personal data.

**A.Insp\_Sys** The examination of the MRTD passport book addressed by the assumption A.Insp\_Sys "Inspection Systems for global interoperability" is covered by the security objectives for the TOE environment OE.Exam\_MRTD "Examination of the MRTD passport book". The security objectives for the TOE environment OE.Prot\_Logical\_MRTD "Protection of data from the logical MRTD" will require the Supplemental Inspection System to implement the PACE V2 Access Control and to protect the logical MRTD data during the transmission and the internal handling.

### 9.1.4 SPD and Security Objectives

Threats	Security Objectives	Rationale
<a href="#">T.Chip_ID</a>	<a href="#">OT.Identification</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Skimming</a>	<a href="#">OT.Data_Conf</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Eavesdropping</a>	<a href="#">OT.Data_Conf</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Forgery</a>	<a href="#">OT.AC_Pers</a> , <a href="#">OT.Data_Int</a> , <a href="#">OT.Prot_Phys-Tamper</a> , <a href="#">OE.Pass_Auth_Sign</a> , <a href="#">OE.Exam_MRTD</a> , <a href="#">OE.Passive_Auth_Verif</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Abuse-Func</a>	<a href="#">OT.Prot_Abuse-Func</a> , <a href="#">OE.Personalization</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Information_Leakage</a>	<a href="#">OT.Prot_Inf_Leak</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Phys-Tamper</a>	<a href="#">OT.Prot_Phys-Tamper</a>	<a href="#">Section 6.1.1</a>
<a href="#">T.Malfunction</a>	<a href="#">OT.Prot_Malfunction</a>	<a href="#">Section 6.1.1</a>

Threats	Security Objectives	Rationale
<a href="#">T.Counterfeit</a>	<a href="#">OT.Chip_Authenticity</a>	<a href="#">Section 6.1.1</a>

**Tableau 1 Threats and Security Objectives - Coverage**

Security Objectives	Threats
<a href="#">OT.AC_Pers</a>	<a href="#">T.Forgery</a>
<a href="#">OT.Data_Int</a>	<a href="#">T.Forgery</a>
<a href="#">OT.Data_Conf</a>	<a href="#">T.Skimming</a> , <a href="#">T.Eavesdropping</a>
<a href="#">OT.Identification</a>	<a href="#">T.Chip_ID</a>
<a href="#">OT.Prot_Abuse-Func</a>	<a href="#">T.Abuse-Func</a>
<a href="#">OT.Prot_Inf_Leak</a>	<a href="#">T.Information_Leakage</a>
<a href="#">OT.Prot_Phys-Tamper</a>	<a href="#">T.Forgery</a> , <a href="#">T.Phys-Tamper</a>
<a href="#">OT.Prot_Malfunction</a>	<a href="#">T.Malfunction</a>
<a href="#">OT.Chip_Authenticity</a>	<a href="#">T.Counterfeit</a>
<a href="#">OE.MRTD_Manufact</a>	
<a href="#">OE.MRTD_Delivery</a>	
<a href="#">OE.Personalization</a>	<a href="#">T.Abuse-Func</a>
<a href="#">OE.Pass_Auth_Sign</a>	<a href="#">T.Forgery</a>
<a href="#">OE.Exam_MRTD</a>	<a href="#">T.Forgery</a>
<a href="#">OE.Passive_Auth_Verif</a>	<a href="#">T.Forgery</a>
<a href="#">OE.Prot_Logical_MRTD</a>	

**Tableau 2 Security Objectives and Threats - Coverage**

Organisational Security Policies	Security Objectives	Rationale
<a href="#">P.Manufact</a>	<a href="#">OT.Identification</a>	<a href="#">Section 6.1.2</a>
<a href="#">P.Personalization</a>	<a href="#">OT.AC_Pers</a> , <a href="#">OT.Identification</a> , <a href="#">OE.Personalization</a>	<a href="#">Section 6.1.2</a>
<a href="#">P.Personal_Data</a>	<a href="#">OT.Data_Int</a> , <a href="#">OT.Data_Conf</a>	<a href="#">Section 6.1.2</a>
<a href="#">P.Sensitive_Data_Protection</a>	<a href="#">OT.Data_Int</a> , <a href="#">OT.Prot_Inf_Leak</a>	<a href="#">Section 6.1.2</a>
<a href="#">P.Key_Function</a>	<a href="#">OT.Prot_Inf_Leak</a> , <a href="#">OT.Prot_Phys-Tamper</a>	<a href="#">Section 6.1.2</a>

**Tableau 3 OSPs and Security Objectives - Coverage**



Security Objectives	Organisational Security Policies
<a href="#">OT.AC Pers</a>	<a href="#">P.Personalization</a>
<a href="#">OT.Data Int</a>	<a href="#">P.Personal Data</a> , <a href="#">P.Sensitive Data Protection</a>
<a href="#">OT.Data Conf</a>	<a href="#">P.Personal Data</a>
<a href="#">OT.Identification</a>	<a href="#">P.Manufact</a> , <a href="#">P.Personalization</a>
<a href="#">OT.Prot Abuse-Func</a>	
<a href="#">OT.Prot Inf Leak</a>	<a href="#">P.Sensitive Data Protection</a> , <a href="#">P.Key Function</a>
<a href="#">OT.Prot Phys-Tamper</a>	<a href="#">P.Key Function</a>
<a href="#">OT.Prot Malfunction</a>	
<a href="#">OT.Chip Authenticity</a>	
<a href="#">OE.MRTD Manufact</a>	
<a href="#">OE.MRTD Delivery</a>	
<a href="#">OE.Personalization</a>	<a href="#">P.Personalization</a>
<a href="#">OE.Pass Auth Sign</a>	
<a href="#">OE.Exam MRTD</a>	
<a href="#">OE.Passive Auth Verif</a>	
<a href="#">OE.Prot Logical MRTD</a>	

**Tableau 4 Security Objectives and OSPs - Coverage**

Assumptions	Security objectives for the Operational Environment	Rationale
<a href="#">A.MRTD Manufact</a>	<a href="#">OE.MRTD Manufact</a>	<a href="#">Section 6.1.3</a>
<a href="#">A.MRTD Delivery</a>	<a href="#">OE.MRTD Delivery</a>	<a href="#">Section 6.1.3</a>
<a href="#">A.Pers Agent</a>	<a href="#">OE.Personalization</a>	<a href="#">Section 6.1.3</a>
<a href="#">A.Insp Sys</a>	<a href="#">OE.Exam MRTD</a> , <a href="#">OE.Prot Logical MRTD</a>	<a href="#">Section 6.1.3</a>

**Tableau 5 Assumptions and Security Objectives for the Operational Environment - Coverage**

Security objectives for the Operational Environment	Assumptions
<a href="#">OE.MRTD_Manufact</a>	<a href="#">A.MRTD_Manufact</a>
<a href="#">OE.MRTD_Delivery</a>	<a href="#">A.MRTD_Delivery</a>
<a href="#">OE.Personalization</a>	<a href="#">A.Pers_Agent</a>
<a href="#">OE.Pass_Auth_Sign</a>	
<a href="#">OE.Exam_MRTD</a>	<a href="#">A.Insp_Sys</a>
<a href="#">OE.Passive_Auth_Verif</a>	
<a href="#">OE.Prot_Logical_MRTD</a>	<a href="#">A.Insp_Sys</a>

**Tableau 6 Security Objectives for the Operational Environment and Assumptions - Coverage**

## 9.2 Security requirements and security objectives

### 9.2.1 Objectives

#### Security Objectives for the TOE

**OT.AC\_Pers** The security objective OT.AC\_Pers "Access Control for Personalization of logical MRTD" addresses the access control of the writing the logical MRTD. The write access to the logical MRTD data are defined by the SFR FDP\_ACC.1 and FDP\_ACF.1 as follows: only the successfully authenticated Personalization Agent is allowed to write the data of the groups EF.DG1 to EF.DG16 of the logical MRTD only once.

The authentication of the terminal as Personalization Agent shall be performed by TSF according to SRF FIA\_UAU.4 and FIA\_UAU.5. The Personalization Agent can be authenticated either by using the PACE V2 mechanism (FCS\_CKM.1, FCS\_COP.1/SHA, FCS\_RND.1 (for key generation), and FCS\_COP.1/ENC as well as FCS\_COP.1/MAC) with the personalization key or for reasons of interoperability with the [R11] by using the symmetric authentication mechanism (FCS\_COP.1/AUTH).

In case of using the PACE V2 mechanism the SFR FIA\_UAU.6 describes the re-authentication and FDP\_UCT.1 and FDP\_UIT.1 the protection of the transmitted data by means of secure messaging implemented by the cryptographic functions according to FCS\_CKM.1, FCS\_COP.1/SHA, FCS\_RND.1 (for key generation), and FCS\_COP.1/ENC as well as FCS\_COP.1/MAC for the ENC\_MAC\_Mode.

The SFR FMT\_SMR.1 lists the roles (including Personalization Agent) and the SFR FMT\_SMF.1 lists the TSF management functions (including Personalization) setting the Document PACE V2 Access Keys according to the SFR FMT\_MTD.1/KEY\_WRITE as authentication reference data. The SFR FMT\_MTD.1/KEY\_READ prevents read access to the secret key of the Personalization Agent Keys and ensure together with the SFR FCS\_CKM.4, FPT\_EMS.1, FPT\_FLS.1 and FPT\_PHP.3 the confidentiality of these keys.

**OT.Data\_Int** The security objective OT.Data\_Int "Integrity of personal data" requires the TOE to protect the integrity of the logical MRTD stored on the MRTD's chip against physical manipulation and unauthorized writing. The write access to the logical MRTD data is defined by the SFR FDP\_ACC.1 and FDP\_ACF.1 in the same way: only the

Personalization Agent is allowed to write the data of the groups EF.DG1 to EF.DG16 of the logical MRTD (FDP\_ACF.1.2, rule 1) and terminals are not allowed to modify any of the data groups EF.DG1 to EF.DG16 of the logical MRTD (cf. FDP\_ACF.1.4). The SFR FMT\_SMR.1 lists the roles (including Personalization Agent) and the SFR FMT\_SMF.1 lists the TSF management functions (including Personalization). The authentication of the terminal as Personalization Agent shall be performed by TSF according to SRF FIA\_UAU.4, FIA\_UAU.5 and FIA\_UAU.6 using either FCS\_COP.1/ENC and FCS\_COP.1/MAC or FCS\_COP.1/AUTH.

The security objective OT.Data\_Int "Integrity of personal data" requires the TOE to ensure that the inspection system is able to detect any modification of the transmitted logical MRTD data by means of the PACE V2 mechanism. The SFR FIA\_UAU.6, FDP\_UCT.1 and FDP\_UIT.1 requires the protection of the transmitted data by means of secure messaging implemented by the cryptographic functions according to FCS\_CKM.1, FCS\_COP.1/SHA, FCS\_RND.1 (for key generation), and FCS\_COP.1/ENC and FCS\_COP.1/MAC for the ENC\_MAC\_Mode. The SFR FMT\_MTD.1/KEY\_WRITE requires the Personalization Agent to establish the Document PACE V2 Access Keys in a way that they cannot be read by anyone in accordance to FMT\_MTD.1/KEY\_READ.

**OT.Data\_Conf** The security objective OT.Data\_Conf "Confidentiality of personal data" requires the TOE to ensure the confidentiality of the logical MRTD data groups EF.DG1 to EF.DG16. The SFR FIA\_UID.1 and FIA\_UAU.1 allow only those actions before identification respective authentication which do not violate OT.Data\_Conf. In case of failed authentication attempts FIA\_AFL.1 enforces additional waiting time prolonging the necessary amount of time for facilitating a brute force attack. The read access to the logical MRTD data is defined by the FDP\_ACC.1 and FDP\_ACF.1.2: the successful authenticated Personalization Agent is allowed to read the data of the logical MRTD (EF.DG1 to EF.DG16). The successful authenticated Supplemental Inspection System is allowed to read the data of the logical MRTD (EF.DG1, EF.DG2 and EF.DG5 to EF.DG16). The SFR FMT\_SMR.1 lists the roles (including Personalization Agent and Supplemental Inspection System) and the SFR FMT\_SMF.1 lists the TSF management functions (including Personalization for the key management for the Document PACE V2 Access Keys).

The SFR FIA\_UAU.4 prevents reuse of authentication data to strengthen the authentication of the user. The SFR FIA\_UAU.5 enforces the TOE to accept the authentication attempt as Supplemental Inspection System only by means of the PACE V2 Access Control Authentication Mechanism with the Document PACE V2 Access Keys. Moreover, the SFR FIA\_UAU.6 requests secure messaging after successful authentication of the terminal with PACE V2 Access Control Authentication Mechanism which includes the protection of the transmitted data in ENC\_MAC\_Mode by means of the cryptographic functions according to FCS\_COP.1/ENC and FCS\_COP.1/MAC (cf. the SFR FDP\_UCT.1 and FDP\_UIT.1). (for key generation), and FCS\_COP.1/ENC and FCS\_COP.1/MAC for the ENC\_MAC\_Mode. The SFR FCS\_CKM.1, FCS\_CKM.4, FCS\_COP.1/SHA and FCS\_RND.1 establish the key management for the secure messaging keys. The SFR FMT\_MTD.1/KEY\_WRITE addresses the key management and FMT\_MTD.1/KEY\_READ prevents reading of the Document PACE V2 Access Keys.

Note, neither the security objective OT.Data\_Conf nor the SFR FIA\_UAU.5 requires the Personalization Agent to use the PACE V2 Access Control Authentication Mechanism or secure messaging.

**OT.Identification** The security objective OT.Identification "Identification and Authentication of the TOE" address the storage of the IC Identification Data uniquely

identifying the MRTD's chip in its non-volatile memory. This will be ensured by TSF according to SFR FAU\_SAS.1.

Furthermore, the TOE shall identify itself only to a successful authenticated Supplemental Inspection System in Phase 4 "Operational Use". The SFR FMT\_MTD.1/INI\_ENA allows only the Manufacturer to write Initialization Data and Pre-personalization Data (including the Personalization Agent key). The SFR FMT\_MTD.1/INI\_DIS allows the Personalization Agent to disable Initialization Data if their usage in the phase 4 "Operational Use" violates the security objective OT.Identification. The SFR FIA\_UID.1 and FIA\_UAU.1 do not allow reading of any data uniquely identifying the MRTD's chip before successful authentication of the Supplemental Inspection System and will stop communication after unsuccessful authentication attempt. In case of failed authentication attempts FIA\_AFL.1 enforces additional waiting time prolonging the necessary amount of time for facilitating a brute force attack.

**OT.Prot\_Abuse-Func** The security objective OT.Prot\_Abuse-Func "Protection against Abuse of Functionality" is ensured by the SFR FMT\_LIM.1 and FMT\_LIM.2 which prevent misuse of test functionality of the TOE or other features which may not be used after TOE Delivery.

**OT.Prot\_Inf\_Leak** The security objective OT.Prot\_Inf\_Leak "Protection against Information Leakage" requires the TOE to protect confidential TSF data stored and/or processed in the MRTD's chip against disclosure

- o 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, which is addressed by the SFR FPT\_EMS.1,
- o by forcing a malfunction of the TOE, which is addressed by the SFR FPT\_FLS.1 and FPT\_TST.1, and/or
- o by a physical manipulation of the TOE, which is addressed by the SFR FPT\_PHP.3.

**OT.Prot\_Phys-Tamper** The security objective OT.Prot\_Phys-Tamper "Protection against Physical Tampering" is covered by the SFR FPT\_PHP.3.

**OT.Prot\_Malfunction** The security objective OT.Prot\_Malfunction "Protection against Malfunctions" is covered by (i) the SFR FPT\_TST.1 which requires self tests to demonstrate the correct operation and tests of authorized users to verify the integrity of TSF data and TSF code, and (ii) the SFR FPT\_FLS.1 which requires a secure state in case of detected failure or operating conditions possibly causing a malfunction.

**OT.Chip\_Authenticity** The security objective OT.Chip\_Authenticity "Protection against forgery" is ensured by the Active Authentication Protocol activated by FMT\_MOF.1/AA and provided by FDP\_DAU.1/AA, FDP\_ACC.1 and FDP\_ACF.1 proving the identity and authenticity of the TOE. The Active Authentication relies on FCS\_COP.1/SIG\_MRTD, FCS\_COP.1/SHA and FCS\_RND.1. It is performed using a TOE internally stored confidential private key as required by FMT\_MTD.1/KEY\_WRITE and FMT\_MTD.1/KEY\_READ, this key being loaded during personalization phase as required by FDP\_ITC.1/AA or generated on-card by FCS\_CKM.1/ASYM.

### 9.2.2 Rationale tables of Security Objectives and SFRs

Security Objectives	Security Functional Requirements	Rationale
<a href="#">OT.AC Pers</a>	<a href="#">FCS_CKM.1</a> , <a href="#">FCS_CKM.4</a> , <a href="#">FCS_COP.1/SHA</a> , <a href="#">FCS_COP.1/ENC</a> , <a href="#">FCS_COP.1/AUTH</a> , <a href="#">FCS_COP.1/MAC</a> , <a href="#">FCS_RND.1</a> , <a href="#">FIA_UAU.4</a> , <a href="#">FIA_UAU.5</a> , <a href="#">FIA_UAU.6</a> , <a href="#">FDP_ACC.1</a> , <a href="#">FDP_ACF.1</a> , <a href="#">FDP_UCT.1</a> , <a href="#">FDP_UIT.1</a> , <a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a> , <a href="#">FMT_MTD.1/KEY_WRITE</a> , <a href="#">FMT_MTD.1/KEY_READ</a> , <a href="#">FPT_EMS.1</a> , <a href="#">FPT_PHP.3</a> , <a href="#">FPT_FLS.1</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Data_Int</a>	<a href="#">FCS_CKM.1</a> , <a href="#">FCS_COP.1/SHA</a> , <a href="#">FCS_COP.1/ENC</a> , <a href="#">FCS_COP.1/AUTH</a> , <a href="#">FCS_COP.1/MAC</a> , <a href="#">FCS_RND.1</a> , <a href="#">FIA_UAU.4</a> , <a href="#">FIA_UAU.5</a> , <a href="#">FIA_UAU.6</a> , <a href="#">FDP_ACC.1</a> , <a href="#">FDP_ACF.1</a> , <a href="#">FDP_UCT.1</a> , <a href="#">FDP_UIT.1</a> , <a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a> , <a href="#">FMT_MTD.1/KEY_WRITE</a> , <a href="#">FMT_MTD.1/KEY_READ</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Data_Conf</a>	<a href="#">FCS_CKM.1</a> , <a href="#">FCS_CKM.4</a> , <a href="#">FCS_COP.1/SHA</a> , <a href="#">FCS_COP.1/ENC</a> , <a href="#">FCS_COP.1/MAC</a> , <a href="#">FCS_RND.1</a> , <a href="#">FIA_UID.1</a> , <a href="#">FIA_AFL.1</a> , <a href="#">FIA_UAU.1</a> , <a href="#">FIA_UAU.4</a> , <a href="#">FIA_UAU.5</a> , <a href="#">FIA_UAU.6</a> , <a href="#">FDP_ACC.1</a> , <a href="#">FDP_ACF.1</a> , <a href="#">FDP_UCT.1</a> , <a href="#">FDP_UIT.1</a> , <a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a> , <a href="#">FMT_MTD.1/KEY_WRITE</a> , <a href="#">FMT_MTD.1/KEY_READ</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Identification</a>	<a href="#">FAU_SAS.1</a> , <a href="#">FIA_UID.1</a> , <a href="#">FIA_AFL.1</a> , <a href="#">FIA_UAU.1</a> , <a href="#">FMT_MTD.1/INI_ENA</a> , <a href="#">FMT_MTD.1/INI_DIS</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Prot_Abuse-Func</a>	<a href="#">FMT_LIM.1</a> , <a href="#">FMT_LIM.2</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Prot_Inf_Leak</a>	<a href="#">FPT_EMS.1</a> , <a href="#">FPT_FLS.1</a> , <a href="#">FPT_TST.1</a> , <a href="#">FPT_PHP.3</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Prot_Phys-Tamper</a>	<a href="#">FPT_PHP.3</a>	<a href="#">Section 6.2.1</a>
<a href="#">OT.Prot_Malfunction</a>	<a href="#">FPT_FLS.1</a> , <a href="#">FPT_TST.1</a>	<a href="#">Section 6.2.1</a>

Security Objectives	Security Functional Requirements	Rationale
<a href="#">OT.Chip Authenticity</a>	<a href="#">FCS CKM.1/ASYM</a> , <a href="#">FCS COP.1/SHA</a> , <a href="#">FCS RND.1</a> , <a href="#">FDP DAU.1/AA</a> , <a href="#">FDP ACC.1</a> , <a href="#">FDP ACF.1</a> , <a href="#">FDP ITC.1/AA</a> , <a href="#">FMT MTD.1/KEY WRITE</a> , <a href="#">FMT MTD.1/KEY READ</a> , <a href="#">FCS COP.1/SIG MRTD</a> , <a href="#">FMT MOF.1/AA</a>	<a href="#">Section 6.2.1</a>

**Tableau 7 Security Objectives and SFRs - Coverage**

Security Functional Requirements	Security Objectives
<a href="#">FAU_SAS.1</a>	<a href="#">OT.Identification</a>
<a href="#">FCS_CKM.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FCS_CKM.4</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Conf</a>
<a href="#">FCS_COP.1/SHA</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a> , <a href="#">OT.Chip Authenticity</a>
<a href="#">FCS_COP.1/ENC</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FCS_COP.1/AUTH</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a>
<a href="#">FCS_COP.1/MAC</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FCS_RND.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a> , <a href="#">OT.Chip Authenticity</a>
<a href="#">FIA_AFL.1</a>	<a href="#">OT.Data Conf</a> , <a href="#">OT.Identification</a>
<a href="#">FIA_UID.1</a>	<a href="#">OT.Data Conf</a> , <a href="#">OT.Identification</a>
<a href="#">FIA_UAU.1</a>	<a href="#">OT.Data Conf</a> , <a href="#">OT.Identification</a>
<a href="#">FIA_UAU.4</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FIA_UAU.5</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FIA_UAU.6</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FDP_ACC.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a> , <a href="#">OT.Chip Authenticity</a>
<a href="#">FDP_ACF.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a> , <a href="#">OT.Chip Authenticity</a>
<a href="#">FDP_UCT.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FDP_UIT.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FMT_SMF.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FMT_SMR.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a>
<a href="#">FMT_LIM.1</a>	<a href="#">OT.Prot Abuse-Func</a>
<a href="#">FMT_LIM.2</a>	<a href="#">OT.Prot Abuse-Func</a>
<a href="#">FMT_MTD.1/INI_ENA</a>	<a href="#">OT.Identification</a>
<a href="#">FMT_MTD.1/INI_DIS</a>	<a href="#">OT.Identification</a>
<a href="#">FMT_MTD.1/KEY_WRITE</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a> , <a href="#">OT.Chip Authenticity</a>
<a href="#">FMT_MT1/KEY_READ</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Data Int</a> , <a href="#">OT.Data Conf</a> , <a href="#">OT.Chip Authenticity</a>
<a href="#">FPT_EMS.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Prot Inf Leak</a>
<a href="#">FPT_FLS.1</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Prot Inf Leak</a> , <a href="#">OT.Prot Malfunction</a>

Security Functional Requirements	Security Objectives
<a href="#">FPT_TST.1</a>	<a href="#">OT.Prot Inf Leak</a> , <a href="#">OT.Prot Malfunction</a>
<a href="#">FPT_PHP.3</a>	<a href="#">OT.AC Pers</a> , <a href="#">OT.Prot Inf Leak</a> , <a href="#">OT.Prot Phys-Tamper</a>
<a href="#">FDP_DAU.1/AA</a>	<a href="#">OT.Chip Authenticity</a>
<a href="#">FCS_COP.1/SIG MRTD</a>	<a href="#">OT.Chip Authenticity</a>
<a href="#">FDP_ITC.1/AA</a>	<a href="#">OT.Chip Authenticity</a>
<a href="#">FMT_MOF.1/AA</a>	<a href="#">OT.Chip Authenticity</a>
<a href="#">FCS_CKM.1/ASYM</a>	<a href="#">OT.Chip Authenticity</a>

**Tableau 8 SFRs and Security Objectives**



## 9.3 Dependencies

### 9.3.1 SFRs dependencies

Requirements	CC Dependencies	Satisfied Dependencies
<a href="#">FAU_SAS.1</a>	No dependencies	
<a href="#">FCS_CKM.1</a>	(FCS_CKM.2 or FCS_COP.1) and (FCS_CKM.4)	<a href="#">FCS_CKM.4</a> , <a href="#">FCS_COP.1/ENC</a> , <a href="#">FCS_COP.1/MAC</a>
<a href="#">FCS_CKM.4</a>	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2)	<a href="#">FCS_CKM.1</a>
<a href="#">FCS_COP.1/SHA</a>	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	<a href="#">FCS_CKM.4</a>
<a href="#">FCS_COP.1/ENC</a>	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	<a href="#">FCS_CKM.1</a> , <a href="#">FCS_CKM.4</a>
<a href="#">FCS_COP.1/AUTH</a>	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	
<a href="#">FCS_COP.1/MAC</a>	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	<a href="#">FCS_CKM.1</a> , <a href="#">FCS_CKM.4</a>
<a href="#">FCS_RND.1</a>	No dependencies	
<a href="#">FIA_AFL.1</a>	(FIA_UAU.1)	<a href="#">FIA_UAU.1</a>
<a href="#">FIA_UID.1</a>	No dependencies	
<a href="#">FIA_UAU.1</a>	(FIA_UID.1)	<a href="#">FIA_UID.1</a>
<a href="#">FIA_UAU.4</a>	No dependencies	
<a href="#">FIA_UAU.5</a>	No dependencies	
<a href="#">FIA_UAU.6</a>	No dependencies	
<a href="#">FDP_ACC.1</a>	(FDP_ACF.1)	<a href="#">FDP_ACF.1</a>
<a href="#">FDP_ACF.1</a>	(FDP_ACC.1) and (FMT_MSA.3)	<a href="#">FDP_ACC.1</a>
<a href="#">FDP_UCT.1</a>	(FDP_ACC.1 or FDP_IFC.1) and (FTP_ITC.1 or FTP_TRP.1)	<a href="#">FDP_ACC.1</a>
<a href="#">FDP_UIT.1</a>	(FDP_ACC.1 or FDP_IFC.1) and (FTP_ITC.1 or FTP_TRP.1)	<a href="#">FDP_ACC.1</a>
<a href="#">FMT_SMF.1</a>	No dependencies	
<a href="#">FMT_SMR.1</a>	(FIA_UID.1)	<a href="#">FIA_UID.1</a>
<a href="#">FMT_LIM.1</a>	(FMT_LIM.2)	<a href="#">FMT_LIM.2</a>
<a href="#">FMT_LIM.2</a>	(FMT_LIM.1)	<a href="#">FMT_LIM.1</a>
<a href="#">FMT_MTD.1/INI_ENA</a>	(FMT_SMF.1) and (FMT_SMR.1)	<a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a>

Requirements	CC Dependencies	Satisfied Dependencies
<a href="#">FMT_MTD.1/INI_DIS</a>	(FMT_SMF.1) and (FMT_SMR.1)	<a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a>
<a href="#">FMT_MTD.1/KEY_WRITE</a>	(FMT_SMF.1) and (FMT_SMR.1)	<a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a>
<a href="#">FMT_MTD.1/KEY_READ</a>	(FMT_SMF.1) and (FMT_SMR.1)	<a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a>
<a href="#">FPT_EMS.1</a>	No dependencies	
<a href="#">FPT_FLS.1</a>	No dependencies	
<a href="#">FPT_TST.1</a>	No dependencies	
<a href="#">FPT_PHP.3</a>	No dependencies	
<a href="#">FDP_DAU.1/AA</a>	No dependencies	
<a href="#">FCS_COP.1/SIG_MRTD</a>	(FCS_CKM.1 or FDP_ITC.1 or FDP_ITC.2) and (FCS_CKM.4)	<a href="#">FCS_CKM.4</a> , <a href="#">FDP_ITC.1/AA</a> , <a href="#">FCS_CKM.1/ASYM</a>
<a href="#">FDP_ITC.1/AA</a>	(FDP_ACC.1 or FDP_IFC.1) and (FMT_MSA.3)	<a href="#">FDP_ACC.1</a>
<a href="#">FMT_MOF.1/AA</a>	(FMT_SMF.1) and (FMT_SMR.1)	<a href="#">FMT_SMF.1</a> , <a href="#">FMT_SMR.1</a>
<a href="#">FCS_CKM.1/ASYM</a>	(FCS_CKM.2 or FCS_COP.1) and (FCS_CKM.4)	<a href="#">FCS_CKM.4</a> , <a href="#">FCS_COP.1/SIG_MRTD</a>

**Tableau 9 SFRs dependencies**

## Rationale for the exclusion of dependencies

**The dependency FCS\_CKM.1 or FDP\_ITC.1 or FDP\_ITC.2 of FCS\_COP.1/SHA is unsupported.** The hash algorithm required by the SFR FCS\_COP.1/SHA does not need any key material. Therefore neither a key generation (FCS\_CKM.1) nor an import (FDP\_ITC.1/2) is necessary.

**The dependency FCS\_CKM.1 or FDP\_ITC.1 or FDP\_ITC.2 of FCS\_COP.1/AUTH is unsupported.** The SFR FCS\_COP.1/AUTH uses the symmetric Personalization Key permanently stored during the Pre-Personalization process (cf. FMT\_MTD.1/INI\_ENA) by the manufacturer. Thus there is neither the necessity to generate or import a key during the addressed TOE lifecycle by the means of FCS\_CKM.1 or FDP\_ITC.

**The dependency FCS\_CKM.4 of FCS\_COP.1/AUTH is unsupported.** Since the key is permanently stored within the TOE there is no need for FCS\_CKM.4, too.

**The dependency FMT\_MSA.3 of FDP\_ACF.1 is unsupported.** The access control TSF according to FDP\_ACF.1 uses security attributes which are defined during the personalization and are fixed over the whole life time of the TOE. No management of these security attribute (i.e. SFR FMT\_MSA.1 and FMT\_MSA.3) is necessary here.

**The dependency FTP\_ITC.1 or FTP\_TRP.1 of FDP\_UCT.1 is unsupported.** The SFR FDP\_UCT.1 requires the use of secure messaging between the MRTD and the BIS. There is no need for SFR FTP\_ITC.1, e.g. to require this communication channel to be logically distinct from other communication channels since there is only one channel. Since the TOE does not provide a direct human interface a trusted path as required by FTP\_TRP.1 is not applicable here.

**The dependency FTP\_ITC.1 or FTP\_TRP.1 of FDP\_UIT.1 is unsupported.** The SFR FDP\_UIT.1 required the use of secure messaging between the MRTD and the BIS. There is no need for SFR FTP\_ITC.1, e.g. to require this communication channel to be logically distinct from other communication channels since there is only one channel. Since the TOE does not provide a direct human interface a trusted path as required by FTP\_TRP.1 is not applicable here.

**The dependency FMT\_MSA.3 of FDP\_ITC.1/AA is unsupported.** FMT\_MSA.3 dependency is not required since this import does not involve any specific security attribute.

### 9.3.2 SARs dependencies

Requirements	CC Dependencies	Satisfied Dependencies
<a href="#">ADV_ARC.1</a>	(ADV_FSP.1) and (ADV_TDS.1)	<a href="#">ADV_FSP.5</a> , <a href="#">ADV_TDS.4</a>
<a href="#">ADV_FSP.5</a>	(ADV_IMP.1) and (ADV_TDS.1)	<a href="#">ADV_IMP.1</a> , <a href="#">ADV_TDS.4</a>
<a href="#">ADV_IMP.1</a>	(ADV_TDS.3) and (ALC_TAT.1)	<a href="#">ADV_TDS.4</a> , <a href="#">ALC_TAT.2</a>
<a href="#">ADV_INT.2</a>	(ADV_IMP.1) and (ADV_TDS.3) and (ALC_TAT.1)	<a href="#">ADV_IMP.1</a> , <a href="#">ADV_TDS.4</a> , <a href="#">ALC_TAT.2</a>

Requirements	CC Dependencies	Satisfied Dependencies
<a href="#">ADV_TDS.4</a>	(ADV_FSP.5)	<a href="#">ADV_FSP.5</a>
<a href="#">AGD_OPE.1</a>	(ADV_FSP.1)	<a href="#">ADV_FSP.5</a>
<a href="#">AGD_PRE.1</a>	No dependencies	
<a href="#">ALC_CMC.4</a>	(ALC_CMS.1) and (ALC_DVS.1) and (ALC_LCD.1)	<a href="#">ALC_CMS.5</a> , <a href="#">ALC_DVS.2</a> , <a href="#">ALC_LCD.1</a>
<a href="#">ALC_CMS.5</a>	No dependencies	
<a href="#">ALC_DEL.1</a>	No dependencies	
<a href="#">ALC_DVS.2</a>	No dependencies	
<a href="#">ALC_LCD.1</a>	No dependencies	
<a href="#">ALC_TAT.2</a>	(ADV_IMP.1)	<a href="#">ADV_IMP.1</a>
<a href="#">ASE_CCL.1</a>	(ASE_ECD.1) and (ASE_INT.1) and (ASE_REQ.1)	<a href="#">ASE_ECD.1</a> , <a href="#">ASE_INT.1</a> , <a href="#">ASE_REQ.2</a>
<a href="#">ASE_ECD.1</a>	No dependencies	
<a href="#">ASE_INT.1</a>	No dependencies	
<a href="#">ASE_OBJ.2</a>	(ASE_SPD.1)	<a href="#">ASE_SPD.1</a>
<a href="#">ASE_REQ.2</a>	(ASE_ECD.1) and (ASE_OBJ.2)	<a href="#">ASE_ECD.1</a> , <a href="#">ASE_OBJ.2</a>
<a href="#">ASE_SPD.1</a>	No dependencies	
<a href="#">ASE_TSS.1</a>	(ADV_FSP.1) and (ASE_INT.1) and (ASE_REQ.1)	<a href="#">ADV_FSP.5</a> , <a href="#">ASE_INT.1</a> , <a href="#">ASE_REQ.2</a>
<a href="#">ATE_COV.2</a>	(ADV_FSP.2) and (ATE_FUN.1)	<a href="#">ADV_FSP.5</a> , <a href="#">ATE_FUN.1</a>
<a href="#">ATE_DPT.3</a>	(ADV_ARC.1) and (ADV_TDS.4) and (ATE_FUN.1)	<a href="#">ADV_ARC.1</a> , <a href="#">ADV_TDS.4</a> , <a href="#">ATE_FUN.1</a>
<a href="#">ATE_FUN.1</a>	(ATE_COV.1)	<a href="#">ATE_COV.2</a>
<a href="#">ATE_IND.2</a>	(ADV_FSP.2) and (AGD_OPE.1) and (AGD_PRE.1) and (ATE_COV.1) and (ATE_FUN.1)	<a href="#">ADV_FSP.5</a> , <a href="#">AGD_OPE.1</a> , <a href="#">AGD_PRE.1</a> , <a href="#">ATE_COV.2</a> , <a href="#">ATE_FUN.1</a>
<a href="#">AVA_VAN.5</a>	(ADV_ARC.1) and (ADV_FSP.4) and (ADV_IMP.1) and (ADV_TDS.3) and (AGD_OPE.1) and (AGD_PRE.1) and (ATE_DPT.1)	<a href="#">ADV_ARC.1</a> , <a href="#">ADV_FSP.5</a> , <a href="#">ADV_IMP.1</a> , <a href="#">ADV_TDS.4</a> , <a href="#">AGD_OPE.1</a> , <a href="#">AGD_PRE.1</a> , <a href="#">ATE_DPT.3</a>

**Tableau 10 SARs dependencies**

## 9.4 EAL rationale

This Security Target chooses EAL5 because developers and users require a high level of independently assured security in a planned development and require a rigorous development approach without incurring unreasonable costs attributable to specialist security engineering techniques.

EAL5 represents a meaningful increase in assurance from EAL4 by requiring semiformal design descriptions, a more structured (and hence analyzable) architecture, and improved mechanisms and/or procedures that provide confidence that the TOE will not be tampered during development.

The assurance components in an evaluation assurance level (EAL) are chosen in a way that they build a mutually supportive and complete set of components. The requirements chosen for augmentation do not add any dependencies, which are not already fulfilled for the corresponding requirements contained in EAL5. Therefore, these components add additional assurance to EAL5, but the mutual support of the requirements and the internal consistency is still guaranteed.

## **9.5 EAL augmentations rationale**

### **9.5.1 *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.

### **9.5.2 *ALC\_DVS.2 Sufficiency of security measures***

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.

ALC\_DVS.2 has no dependencies.

## 10 PP CLAIMS

### 10.1 PP reference

The PP SAC in CC3.1 [R10] is claimed.

### 10.2 PP additions

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

The following SFRs are added to the standard PP for the TOE:

- FCS\_COP.1 / SIG\_MRTD
- FDP\_DAU.1 / AA
- FDP\_ITC / AA
- FMT\_MOF.1 / AA
- FCS\_CKM.1 / ASYM

The following Objective for the TOE is added to the standard PP:

- OT.Chip\_authenticity "Protection against forgery"

The following Threat is added to the standard PP:

- T.counterfeit

Moreover, the composition with the IC mandates to introduce complementary OSPs:

- P.Sensitive\_Data\_Protection "Protection of sensitive data"
- P.Key\_Function "Design of the cryptographic routines in order to protect the keys"

## 11 Composition with IC Security Target

IC Elements	Relevant	Consistent in ST with	Justification
A.Process-Sec-IC	Yes	P.Manufact	Security procedures are used during TOE packaging, finishing and pre-personalisation (During Phase 2)
A.Plat-Appl	No	n/a	This assumption deals with the development process and is therefore covered by the evaluation
A.Resp-Appl	Yes	P.Sensitive_Data_Protection	The Composite TOE ensure the confidentiality of the cryptographic keys it stores
A.Check-Init	Yes	P.Manufact	ICs are actually identified uniquely
A.Key-Function	Yes	P.Key_Function	The Cryptographic routines are designed in such a way that they do not compromise key by any leak of information
P.Add-Components	Yes	P.Sensitive_Data_Protection	The TOE ensure protection of data using especially the 3DES and AES algorithms
T.Leak-Inherent	Yes	(1)	(1)
T.Phys-Probing	Yes	(1)	(1)
T.Malfunction	Yes	(1)	(1)
T.Phys-Manipulation	Yes	(1)	(1)
T.Leak-Forced	Yes	(1)	(1)
T.Abuse-Func	Yes	(1)	(1)
T.RND	Yes	(1)	(1)
OE.Plat-Appl	No	n/a	This assumption deals with the development process and is therefore covered by the evaluation
OE.Resp-Appl	Yes	P.Sensitive_Data_Protection	The Composite TOE ensure the confidentiality of the cryptographic keys it stores as well as the integrity of all the sensitive data.

IC Elements	Relevant	Consistent in ST with	Justification
OE.Process-Sec-IC	Yes	P.Manufact	This objective is ensured by the security procedures and manufacturing guidelines of NXP manufacturing site
OE.Check-Init	Yes	P.Manufact	ICs are actually identified uniquely
O.Leak-Inherent	Yes	OT.Prot_Inf_Leak OT.Prot_Phys_Tamper	Software is designed to be protected against leakage with the hardware support
O.Phys-Probing	Yes	OT.Prot_Inf_Leak OT.Prot_Phys_Tamper	Objective require that memory and execution cannot be probed
O.Malfunction	Yes	OT.Prot_Malfunction	Correct operation of the TOE is controlled and malfunctions are detected
O.Phys-Manipulation	Yes	OT.Prot_Inf_Leak OT.Prot_Phys_Tamper	Manipulation of the memory and the execution is controlled by the software. This is achieved with the hardware support
O.Leak-Forced	Yes	OT.Prot_Inf_Leak OT.Prot_Phys_Tamper	Software is designed to be protected against leakage with the hardware support
O.Abuse-Func	Yes	OT.Prot_Abuse-Func	Improper usage of the TOE is controlled
O.Identification	Yes	OT.Identification	Identification is fully handled during whole lifecycle of the TOE from IC manufacturing to use phase.
O.RND	Yes	OT.AC_Pers OT.Data_Int OT_Data_Conf	The Cryptographic routines are designed in such a way that they do not compromise random values in order to ensure confidentiality, integrity and proof of origin.
O.HW_DES3	Yes	OT.AC_Pers OT.Data_Int OT_Data_Conf	3DES algorithm is used to enforce data integrity, data confidentiality and authentications.
O.HW_AES	Yes	OT.AC_Pers OT.Data_Int	AES algorithm is used to enforce the authentication of the personalization agent.
O.MF_HW	No	n/a	Mifare is not supported
O.MEM_ACCESS	No	n/a	Not used.
O.SFR_ACCESS	No	n/a	Not used.



IC Elements	Relevant	Consistent in ST with	Justification
FRU_FLT.2	Yes	(2)	(2)
FPT_FLS.1	Yes	(2)	(2)
FMT_LIM.1	Yes	(2)	(2)
FMT_LIM.2	Yes	(2)	(2)
FAU_SAS.1	Yes	(2)	(2)
FPT_PHP.3	Yes	(2)	(2)
FDP_ITT.1	Yes	(2)	(2)
FPT_ITT.1	Yes	(2)	(2)
FDP_IFC.1	Yes	(2)	(2)
FCS_RNG.1	Yes	(2)	(2)
FCS_COP.1[DES]	Yes	(2)	(2)
FCS_COP.1[AES]	Yes	(2)	(2)
FDP_ACC.1[MEM]	Yes	(2)	(2)
FDP_ACC.1[SFR]	Yes	(2)	(2)
FDP_ACF.1[MEM]	Yes	(2)	(2)
FDP_ACF.1[SFR]	Yes	(2)	(2)
FMT_MSA.3[MEM]	Yes	(2)	(2)
FMT_MSA.3[SFR]	Yes	(2)	(2)
FMT_MSA.1[MEM]	Yes	(2)	(2)
FMT_MSA.1[SFR]	Yes	(2)	(2)
FMT_SMF.1	Yes	(2)	(2)

- (1) Since IC objectives are consistent with TOE objectives, IC Threats are also consistent with TOE SPD
- (2) Since IC SFRs are translations of IC objectives, IC SFRs are consistent with TOE SFRs

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## 13 ACRONYMS

AA	Active Authentication
BAC	Basic Access Control
CC	Common Criteria Version 3.1 revision 3
CPLC	Card personalisation life cycle
DF	Dedicated File
DFA	Differential Fault Analysis
DG	Data Group
EAL	Evaluation Assurance Level
EF	Elementary File
EFID	File Identifier
DES	Digital encryption standard
DH	Diffie Hellmann
I/O	Input/Output
IC	Integrated Circuit
ICAO	International Civil Aviation organization
ICC	Integrated Circuit Card
IFD	Interface device
LDS	Logical Data structure
MF	Master File
MRTD	Machine readable Travel Document
MRZ	Machine readable Zone
MSK	Manufacturer Secret Key
OS	Operating System
PKI	Public Key Infrastructure
PP	Protection Profile
SAC	Supplemental Access Control
SFI	Short File identifier
SHA	Secure hashing Algorithm
SOD	Security object Data
TOE	Target of Evaluation
TSF	TOE Security function

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