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Germany

Test report no.	**:**	**1-0510-01-04/08**
Type identification	**:**	**Shieldings for ePassport and NIK**
Applicant	**:**	**Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, The Netherlands**

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1 General Information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test Laboratory Manager:

2008-05-27	**Joachim Wolf**	
Date	Name	Signature

Technical Responsibility for Area of Testing:

2008-05-27	**Andreas Ehre**	
Date	Name	Signature

1.2 Testing Laboratory

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1.3 Details of Applicant

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Country:	**The Netherlands**
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1.4 Application Details

Date of receipt of order:	**2008-05-13**
Date of receipt of test item:	**2008-05-20**
Date of test:	**2008-05-21 .. 2008-05-27**

Persons(s) who have been present during the test:

1.5 Information about test item

Description of the Test Item:	
Type Identification:	Shieldings for ePassport and NIK Separate NIK sleeves from different manufacturers ePassports with integrated shielding capabilities
Serial Number:	none
Hardware Version:	not relevant
Software Version:	not relevant
Description of System under Test (SUT):	Shieldings for ePassport and NIK
Additional Information	For this test several separated NIK Shielding sleeves and three different types of ePassports with respective integrated shielding have been provided. The NIK sleeves are identified in this report as follows: NIK 1: Smart Tools (metal shield and transparent sleeve) NIK 2: Smartcard Focus (Skimstopper) NIK 3: RFID Shield (blue sleeve) NIK 4: CSN (white sleeve without any printing on it) NIK 5: Identity Stronghold (booklet) NIK 6: Identity Stronghold (badge holder) NIK 7: box for business cards with two cases NIK 8: box for business cards with one case The ePassport samples are identified in this report as follows ePassport A – Shielding in the back cover ePassport B – Shielding in two visa pages ePassport C – Shielding in the front and the back cover

Manufacturer Sleeves:	
Name:	various manufacturers
Street:	
Town:	
Country:	

Manufacturer ePassports:	
Name:	SDU Identification
Street:	Oudeweg 32
Town:	2000 GH Haarlem
Country:	The Netherlands

1.6 Photo documentation of the test items

Photo 1 – NIK 1

Photo 2 – NIK 2

Photo 3 – NIK 3

Photo 4 – NIK 4

Photo 5 – NIK 5

Photo 6 – NIK 6

Photo 7 – NIK 7

Photo 8 – NIK 8

Photo 9 – ePassport Sample
(no visible differences between the 3 types)

Photo 10 – ePassport Sample
(no visible differences between the 3 types)

1.7 Test Method

The testing of the Shielding Capabilites has been performed using the following procedures:

1.7.1 Testing of NIK Shielding

1.7.1.1 Test Set-Up

For the Testing of the NIK Sleeves a Test PCD Assembly as specified in ISO 10 373-6 has been modified in a way, that one of the sense coils was removed. This modification provided enough space to turn the sleeves in various ways during the testing without colliding with the generator coil. A centre point and a coordinate system were defined to specify the various positions of the NIK Sleeve during the test. The following coordinate system was used for the testing (shown in relation with the test set-up):

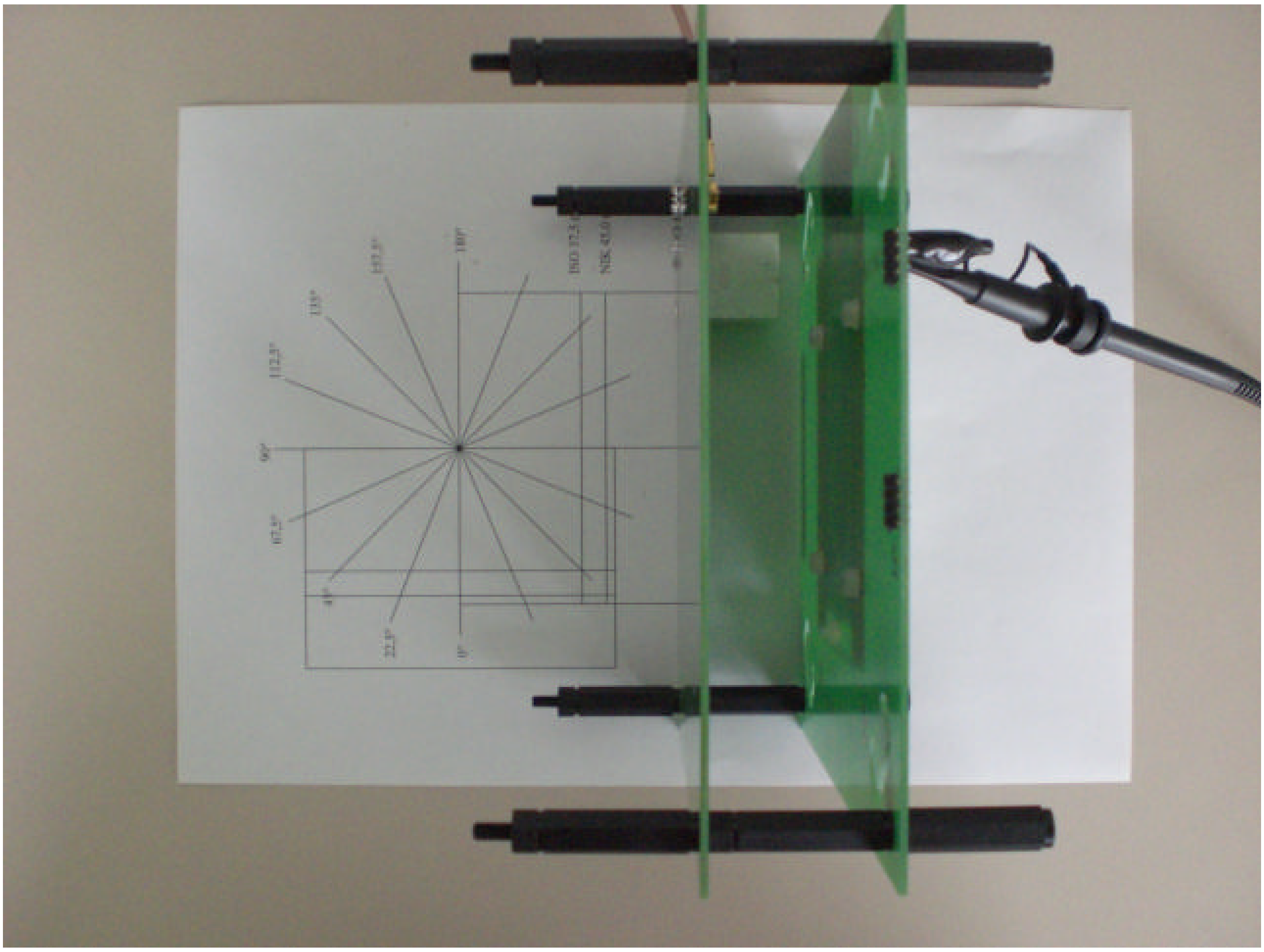


Photo 11 – Test Set-Up

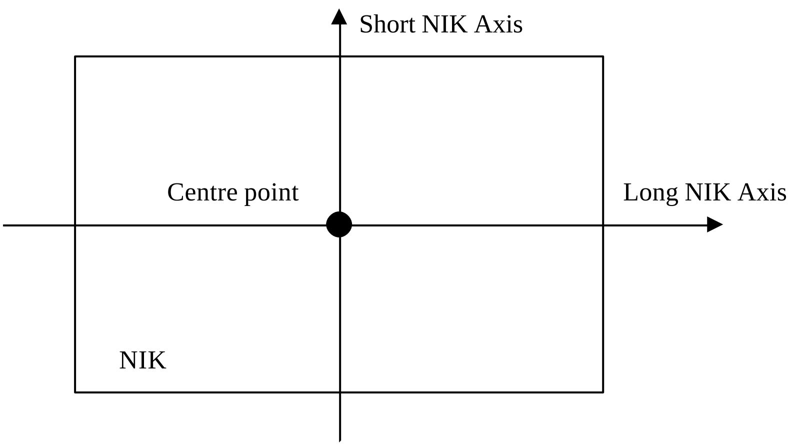
For testing the NIK sleeves the centre point was choosen at a distance of 45 mm from the generator antenna loop. This distance was required to allow turning the NIK sleeves in any direction by 360 degree.

During the test a constant field was induced by connecting a generator at 13,56 MHz to the generator loop of the Test PCD Assembly. The field was monitored by using a calibration coil which was placed according to ISO 10 373-6. The field strength as measured at this calibration coil is reported with the test results down below, hovever, as the measurement is made on a comparison basis at the position of interest, this value was only used to monitor the presence of a steady field, the value itself is provided for information only.

1.7.1.2 Test Procedure

In a first step, the maximum field strength which could be achieved in the relevant NIK sleeve positions was recorded by placing a non-shielded calibration coil (one loop, high impedance) at the relevant positions. The following positions were defined as relevant positions for the NIK sleeves:

	Distance (centre point to generator antenna)	Inclination via the short NIK axis	Inclination via the long NIK axis
Position 1	45 mm	0 °	0 °
Position 2	45 mm	0 °	22,5 °
Position 3	45 mm	0 °	45 °
Position 4	45 mm	0 °	67,5 °
Position 5	45 mm	0 °	90 °
Position 6	45 mm	0 °	0 °
Position 7	45 mm	22,5 °	0 °
Position 8	45 mm	45 °	0 °
Position 9	45 mm	67,5 °	0 °
Position 10	45 mm	90 °	0 °
Note: An inclination of 0 ° means that the NIK RFID antenna is co-oriented with the generator loop.			



In a second step the calibration coil was put into the sleeve, always to the position within the sleeve, where the NIK was to be expected in normal use. The NIK sleeve was then positioned to the aforementioned positions in a way, guaranteeing that the calibration coil (used for measuring the remaining field in the shielded surrounding) being at the same positions as defined above.

In a third step the recorded values for the achieved field strength in the non-shielded case (basis) and the remaining field when a shielding was used were compared to each other leading to the shielding capabilities of the sleeves by using the following formula:

$$A = 20 * \log (H_{shielded}/H_{non\text{-}shielded})$$

1.7.2 Testing of ePassport Shielding

1.7.2.1 Test Set-Up

For the Testing of the ePassport Shielding a Test PCD Assembly as specified in ISO 10 373-6 has been modified in a way, that one of the sense coils was removed. This modification provided enough space to turn the ePassport in various ways during the testing without colliding with the generator coil. A centre point and a coordinate system were defined to specify the various positions of the ePassport during the test. The following coordinate system was used for the testing (shown in relation with the test set-up):

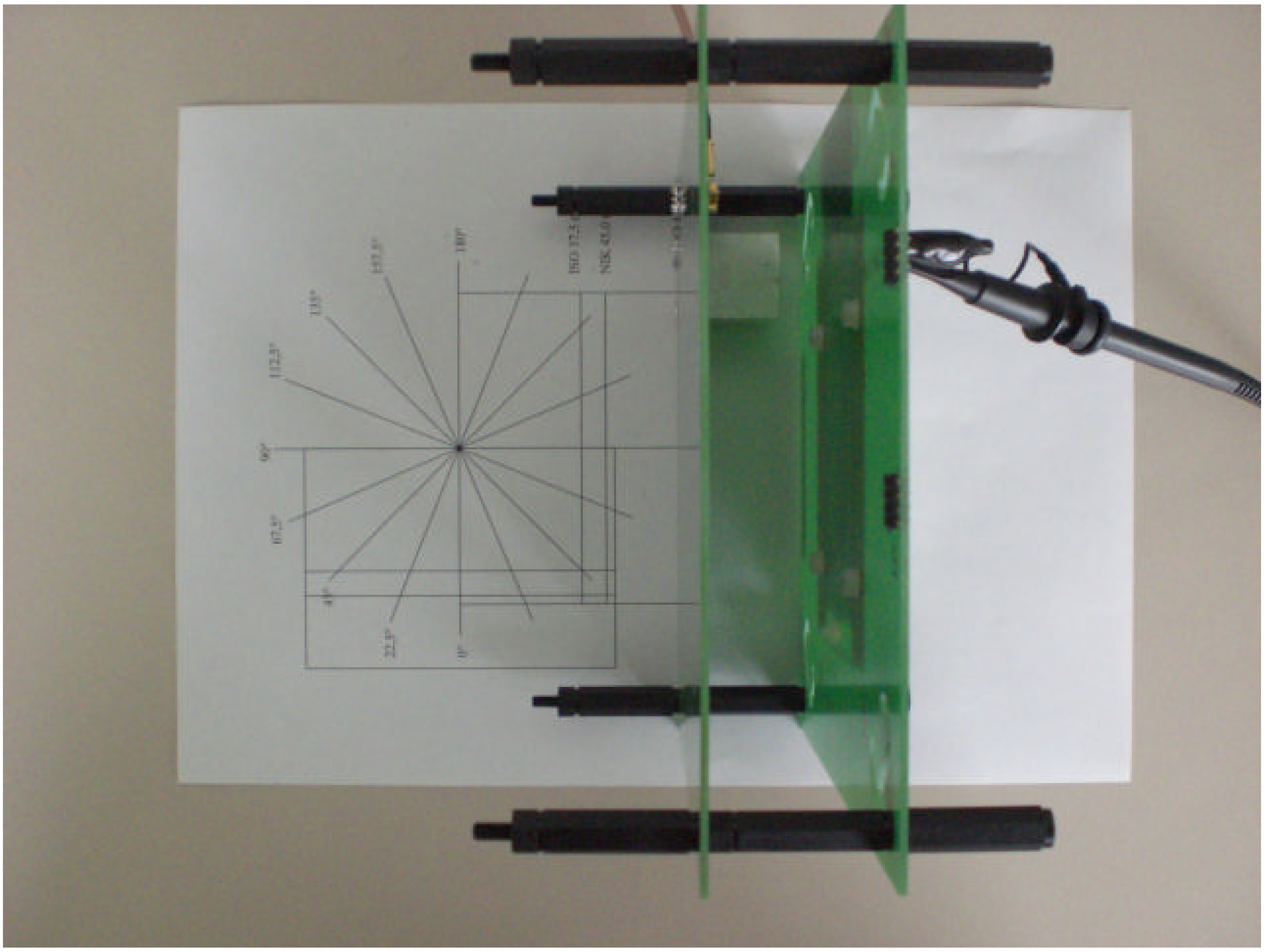


Photo 12 – Test Set-Up

For testing the ePassport the centre point was choosen at a distance of 62,5 mm from the generator antenna loop. This distance was required to allow turning the ePassport 360 ° over the short ePassport axis for the various agreed ePassport conditions (firmly closed, front open, back open). Turning over the long ePassport axis was not necessary, as the worst case scenario is already achieved by tuning in one direction.

During the test a constant field was induced by connecting a generator at 13,56 MHz to the generator loop of the Test PCD Assembly. The field was monitored by using a calibration coil which was placed according to ISO 10 373-6. The field strength as measured at this calibration coil is reported with the test results down below, hovever, as the measurement is made on a comparison basis at the position of interest, this value was only used to monitor the presence of a steady field, the value itself is provided for information only.

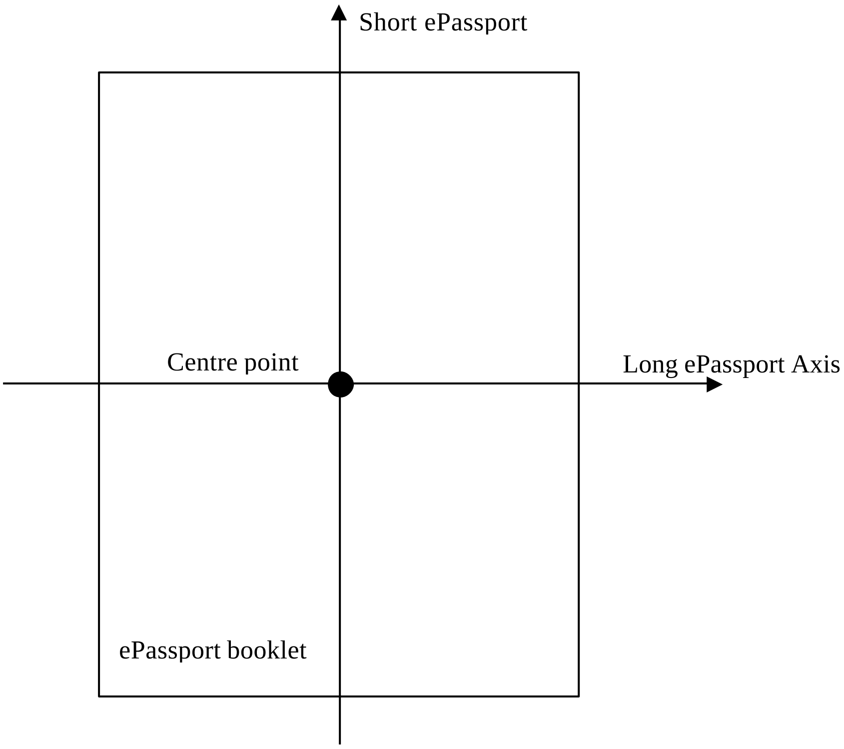
1.7.2.2 Test Procedure

In a first step, the maximum field strength which could be achieved in the relevant ePassport positions was recorded by placing a non-shielded ePassport at the relevant positions. The achievable field strength was recorded with a calibration coil (one loop, high impedance) as close as possible to the ePassport's tag antenna. The following positions were defined as relevant positions for the ePasssports:

	Distance (centre point to generator antenna)	Inclination via the short ePassport axis	Inclination via the long ePassport axis
Position 1	62,5 mm	-90 °	0 °
Position 2	62,5 mm	-67,5 °	0 °
Position 3	62,5 mm	-45 °	0 °
Position 4	62,5 mm	-22,5 °	0 °
Position 5	62,5 mm	0 °	0 °
Position 6	62,5 mm	22,5 °	0 °
Position 7	62,5 mm	45 °	0 °
Position 8	62,5 mm	67,5 °	0 °
Position 9	62,5 mm	90 °	0 °
Note: An inclination of -90 ° via the short ePassport axis means that the spine of the booklet is facing the generator antenna; an inclination of 0 ° means that the ePassport antenna is co-oriented with the generator loop.			

The centre point of the ePassport was defined as the centre point of the ePassport RFID antenna which is placed in the data page of the ePassport.

In contradiction to the NIK sleeve case, for the ePassport case the inclination of the short ePassport axis must be turned by 180 ° as the different ePassport conditions (firmly closed, front open, back open) and the different ePassport shielding types (front cover/back cover) had to be considered when searching for the worst case positions.



In a second step the shielded ePassports were placed to the various positions. A calibration coil was brought as close as possible to the position of the ePassport RFID tag antenna as shown in the figure below. The ePassport was then positioned to the aforementioned positions in a way, guaranteeing that the ePassport RFID antenna being at the same positions as defined above (centre point definition). With this also the calibration coil was always at the same position during the measurement in all ePassport conditions.

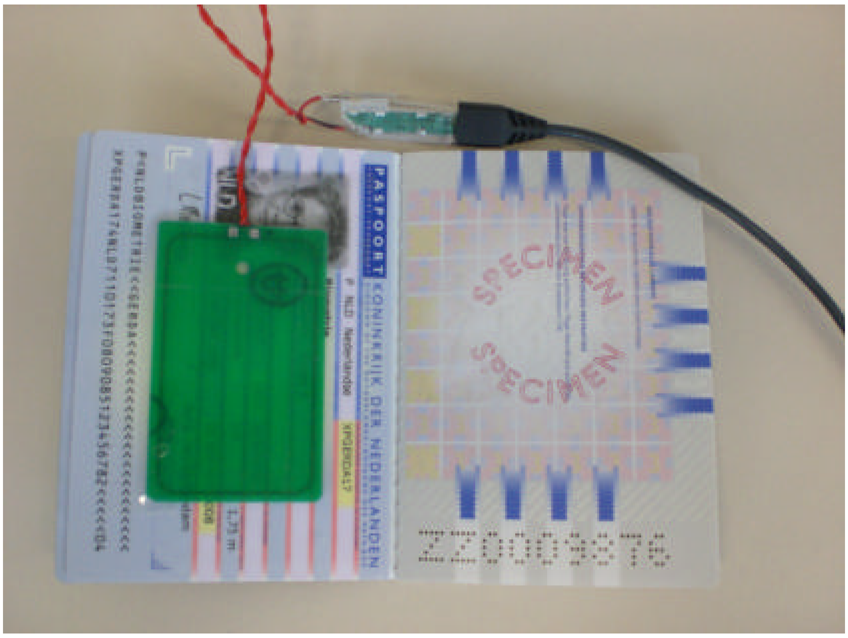


Photo 13 – Calibration Coil Positioning

In a third step the recorded values for the achieved field strength in the non-shielded case (basis) and the remaining field when a shielding was used were compared to each other leading to the shielding capabilities of the sleeves by using the following formula:

$$A = 20 * \log (H_{shielded}/H_{non\text{-}shielded})$$

1.7.2.3 ePassport Configuration for testing

The following ePassport configurations were tested upon request by the customer:

1) ePassport firmly closed
2) ePassport front open
   Distance between the holder page and the front cover: 7,5 cm
   Distance between the holder page and the back cover: 0,7 cm
3) ePassport back open
   Distance between the holder page and the front cover: 0,2 cm
   Distance between the holder page and the back cover: 6,0 cm

Remark: The distance between the holder page and the cover was made by adding spacing hardpaper to the ePassport and by fixing the whole configuration with rubber strips. The spacing was always placed directly beside the holder page.

1.8 Test Equipment utilised

To simplify the identification of the test equipment used on each page of the test report, each item of test equipment and ancillaries such as probes are identified throughout the report by numbers in brackets according to the table below.

No.	Instrument/Ancillary	Source	Inventary ID
1.	ISO 10373-6 Test Apparatus	Arsenal Research	300003401
2.	Modified ISO 10373-6 Test Apparatus	Arsenal Research, modified by CETECOM	300003402
3.	Micropross MP300TCL1	Micropross	300003383
4.	TX/RX-Antenna	Micropross	300003383
5.	Spy-Antenna	Micropross	ISN:TNB198
6.	Calibration Coil	Arsenal Research	300003403
7.	Active Probe LeCroy HFP 100 P6202	LeCroy	300003417
8.	LeCroy Digital Storage Oscilloscope	LeCroy	300003390
9.	RF Amplifier 50 W	Amplifier Research	AR13503
10.	Control PC	Toshiba	300003365
11.	CETECOM Test Software	CETECOM	Version 2.0 beta1

1.9 Test Environment

Temperature: + 22 °C,

Relative humidity content: 55 %

Other parameters: not relevant

2 Technical Tests

2.1 Summary of Test Results

2.1.1 Test Result Summary for the NIK Sleeves

In the following Tables the measured resulting attenuation of the investigated shielding is presented:

	NIK 1	NIK 2	NIK3	NIK4	NIK 5	NIK 6	NIK 7	NIK 8
Average attenuation for the worst case positions	-21,23 dB	-25,06 dB	-21,19 dB	-24,97 dB	-24,57 dB	-24,61 dB	-21,89 dB	-20,93 dB

Note: See sections below for the definition of worst case positions and detailed results.

2.1.2 Test Result Summary for the ePassports

In the following Tables the measured resulting attenuation of the investigated shielding is presented:

Average attenuation for the worst case positions	ePassport A Shielding in back cover	ePassport B Shielding in 2 visa pages	ePassport C Shielding in front and back cover
Condition 1: ePassport firmly closed	-10,98 dB	-13,49 dB	-25,80 dB
Condition 2: ePassport front open	-6,33 dB	-6,52 dB	-8,64 dB
Condition 3: ePassport back open	-1,06 dB	-0,69 dB	-12,18 dB

Note: See sections below for the definition of worst case positions and detailed results.

2.2 Detailed Test Results

2.2.1 Test Results for the NIK Sleeves

In the following Tables the measured field strengths and the resulting attenuation of the investigated shielding is presented:

2.2.1.1 Shielding Capabilities of NIK 1

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 1	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,935	-21,50
2	0	22,5	10,01	0,8932	-20,99
3	0	45	7,81	0,6325	-21,83
4	0	67,5	3,872	0,4807	-18,12
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,9405	-21,45
7	22,5	0	10,12	0,902	-21,00
8	45	0	7,645	0,605	-22,03
9	67,5	0	3,949	0,484	-18,23
10	90	0	0,484	0,484	0,00
Average					**-21,23**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.2 Shielding Capabilities of NIK 2

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 2	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,6809	-24,25
2	0	22,5	10,01	0,5082	-25,89
3	0	45	7,81	0,5434	-23,15
4	0	67,5	3,872	0,495	-17,87
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,6765	-24,31
7	22,5	0	10,12	0,5192	-25,80
8	45	0	7,645	0,506	-23,58
9	67,5	0	3,949	0,495	-18,04
10	90	0	0,484	0,484	0,00
Average					**-25,06**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.3 Shielding Capabilities of NIK 3

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 3	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,935	-21,50
2	0	22,5	10,01	0,902	-20,90
3	0	45	7,81	0,5709	-22,72
4	0	67,5	3,872	0,55	-16,95
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,946	-21,40
7	22,5	0	10,12	0,9075	-20,95
8	45	0	7,645	0,5852	-22,32
9	67,5	0	3,949	0,539	-17,30
10	90	0	0,484	0,484	0,00
Average					**-21,19**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.4 Shielding Capabilities of NIK 4

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 4	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,6941	-24,09
2	0	22,5	10,01	0,506	-25,93
3	0	45	7,81	0,528	-23,40
4	0	67,5	3,872	0,495	-17,87
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,7062	-23,94
7	22,5	0	10,12	0,5115	-25,93
8	45	0	7,645	0,5203	-23,34
9	67,5	0	3,949	0,495	-18,04
10	90	0	0,484	0,484	0,00
Average					**-24,97**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.5 Shielding Capabilities of NIK 5

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 5	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,6578	-24,55
2	0	22,5	10,01	0,583	-24,70
3	0	45	7,81	0,5709	-22,72
4	0	67,5	3,872	0,484	-18,06
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,6688	-24,41
7	22,5	0	10,12	0,594	-24,63
8	45	0	7,645	0,5786	-22,42
9	67,5	0	3,949	0,495	-18,04
10	90	0	0,484	0,484	0,00
Average					**-24,57**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.6 Shielding Capabilities of NIK 6

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 6	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,561	-25,94
2	0	22,5	10,01	0,781	-22,16
3	0	45	7,81	0,5885	-22,46
4	0	67,5	3,872	0,484	-18,06
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,5973	-25,39
7	22,5	0	10,12	0,572	-24,96
8	45	0	7,645	0,5885	-22,27
9	67,5	0	3,949	0,484	-18,23
10	90	0	0,484	0,484	0,00
Average					**-24,61**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.7 Shielding Capabilities of NIK 7

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 7	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	0,803	-22,82
2	0	22,5	10,01	0,913	-20,80
3	0	45	7,81	0,8074	-19,71
4	0	67,5	3,872	0,792	-13,78
5	0	90	0,484	0,484	0,00
6	0	0	11,11	0,792	-22,94
7	22,5	0	10,12	0,902	-21,00
8	45	0	7,645	0,7975	-19,63
9	67,5	0	3,949	0,803	-13,84
10	90	0	0,484	0,484	0,00
Average					**-21,89**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.1.8 Shielding Capabilities of NIK 8

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with NIK 8	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	0	0	11,11	1,089	-20,17
2	0	22,5	10,01	0,836	-21,56
3	0	45	7,81	0,715	-20,77
4	0	67,5	3,872	0,594	-16,28
5	0	90	0,484	0,484	0,00
6	0	0	11,11	1,078	-20,26
7	22,5	0	10,12	0,8305	-21,72
8	45	0	7,645	0,7216	-20,50
9	67,5	0	3,949	0,5852	-16,58
10	90	0	0,484	0,484	0,00
Average					**-20,93**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 13,3 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.2 Test Results for the ePassports

In the following Tables the measured field strengths and the resulting attenuation of the investigated shielding is presented:

2.2.2.1 Shielding Capabilities of ePassport A – Shielding in the back cover

Configuration 1: ePassport firmly closed

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport A	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,748	-2,34
2	-67,5	0	1,7622	0,352	-13,99
3	-45	0	2,794	0,572	-13,78
4	-22,5	0	3,3605	0,9075	-11,37
5	0	0	3,7741	1,166	-11,37
6	22,5	0	3,531	1,023	-10,20
7	45	0	3,102	1,012	-10,76
8	67,5	0	1,8271	0,902	-9,73
9	90	0	0,682	0,484	-6,13
Average					**-10,98**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Configuration 2: ePassport front open

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport A	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,352	-8,88
2	-67,5	0	1,7622	0,836	-6,48
3	-45	0	2,794	1,32	-6,51
4	-22,5	0	3,3605	1,65	-6,18
5	0	0	3,7741	1,76	-6,18
6	22,5	0	3,531	1,738	-6,63
7	45	0	3,102	1,43	-6,16
8	67,5	0	1,8271	1,43	-6,73
9	90	0	0,682	0,352	-2,13
Average:					**-6,33**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Configuration 2: ePassport back open

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport A	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,66	-3,42
2	-67,5	0	1,7622	1,65	-0,57
3	-45	0	2,794	2,53	-0,86
4	-22,5	0	3,3605	2,97	-1,07
5	0	0	3,7741	3,355	-1,07
6	22,5	0	3,531	3,245	-1,02
7	45	0	3,102	2,695	-0,73
8	67,5	0	1,8271	1,804	-1,22
9	90	0	0,682	1,155	-0,11
Average:					**-1,06**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.2.2 Shielding Capabilities of ePassport B – Shielding in 2 visa pages

Configuration 1: ePassport firmly closed

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport B	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,297	-10,36
2	-67,5	0	1,7622	0,132	-22,51
3	-45	0	2,794	0,4675	-15,53
4	-22,5	0	3,3605	0,704	-13,58
5	0	0	3,7741	0,814	-13,58
6	22,5	0	3,531	0,715	-13,32
7	45	0	3,102	0,484	-13,87
8	67,5	0	1,8271	0,143	-16,14
9	90	0	0,682	0,264	-22,13
Average					**-13,49**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Configuration 2: ePassport front open

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport B	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,088	-20,93
2	-67,5	0	1,7622	0,858	-6,25
3	-45	0	2,794	1,397	-6,02
4	-22,5	0	3,3605	1,595	-6,47
5	0	0	3,7741	1,76	-6,47
6	22,5	0	3,531	1,54	-6,63
7	45	0	3,102	1,21	-7,21
8	67,5	0	1,8271	0,99	-8,18
9	90	0	0,682	0,374	-5,32
Average:					**-6,52**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Configuration 2: ePassport back open

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport B	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,33	-9,45
2	-67,5	0	1,7622	1,65	-0,57
3	-45	0	2,794	2,53	-0,86
4	-22,5	0	3,3605	3,19	-0,45
5	0	0	3,7741	3,3	-0,45
6	22,5	0	3,531	3,08	-1,17
7	45	0	3,102	2,585	-1,19
8	67,5	0	1,8271	1,65	-1,58
9	90	0	0,682	1,1	-0,89
Average:					**-0,69**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

2.2.2.3 Shielding Capabilities of ePassport C – Shielding in front and back cover

Configuration 1: ePassport firmly closed

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport C	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,2134	-13,23
2	-67,5	0	1,7622	0,2068	-18,61
3	-45	0	2,794	0,2002	-22,90
4	-22,5	0	3,3605	0,1848	-25,19
5	0	0	3,7741	0,1683	-25,19
6	22,5	0	3,531	0,1595	-27,01
7	45	0	3,102	0,1452	-26,90
8	67,5	0	1,8271	0,1562	-26,59
9	90	0	0,682	0,1782	-21,36
Average					**-25,80**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Configuration 2: ePassport front open

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport C	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,88	-0,93
2	-67,5	0	1,7622	0,209	-18,52
3	-45	0	2,794	0,726	-11,71
4	-22,5	0	3,3605	1,166	-9,19
5	0	0	3,7741	1,584	-9,19
6	22,5	0	3,531	1,76	-7,54
7	45	0	3,102	1,76	-6,05
8	67,5	0	1,8271	1,32	-4,92
9	90	0	0,682	0,66	-2,82
Average:					**-8,64**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Configuration 2: ePassport back open

Test No.	inclination Short Axis	inclination Long Axis	field strength without shielding	field strength with ePassport C	achieved attenuation
	[°]	[°]	[A/m]	[A/m]	[dB]
1	-90	0	0,979	0,506	-5,73
2	-67,5	0	1,7622	0,803	-6,83
3	-45	0	2,794	0,902	-9,82
4	-22,5	0	3,3605	0,902	-11,42
5	0	0	3,7741	0,781	-11,42
6	22,5	0	3,531	0,693	-13,68
7	45	0	3,102	0,605	-14,14
8	67,5	0	1,8271	0,484	-14,20
9	90	0	0,682	0,11	-11,54
Average:					**-12,18**
Field Strength observed and monitored at the ISO 10 373-6 calibration coil (37,5 mm distance): 11,25 A/m					

Remark: The lines shaded in beige show the scenarios in which the highest field strengths could be achieved. These have to be defined as the worst case scenarios. The average given in the last row is an average over the values achieved in the worst case scenarios as defined before.

3 Observations

No observations other than reported in the test case sections have been made during the performance of the tests.