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THE STUDY OF DOCUMENTS COUNTERFEIT PROCEDURES BY ANALYZING THE SECURITY ELEMENTS

Daniel POTOLINCA[1], Ion SANDU[2*], Gabriel Ion OLTEANU[1], Gabi DROCHIOIU[2], Vasile SIRBU[2],

[1]"Al.I.Cuza" Police Academy of Bucharest, Aleea Privighetorilor, no. 1A, Bucharest, Romania;
[2]"Al.I.Cuza" University of Iasi, 22 Blvd. Carol I, 700506, Iasi, Romania
[*]Adress author correspondent: ion.sandu@uaic.ro

Abstract

The paper focuses on the counterfeiting of travel documents by identifying the safety elements. In this purpose, there are presented both new materials and manufacturing procedures of theses documents and the actual procedures of counterfeiting. There are also presented the specific methods of identifying and are analysed some case studies faced to their afferent specimens.

Keywords*: travel document; counterfeiter; wathermark; retro-reflective, optical variable and hidden image; fluorescent impressions.*

Introduction

The justice activity of preventing and fighting against criminality requires the immediate and complete discovery of contraventions, identification of offenders, determination without any doubt of their guilt and in relation to it, the applying of the punishment provided by the penal law. For this purpose, the prosecution and the court have both the right and the duty to apply to all permitted means by which the truth can be determined, the situation being valid also in judging the civil cause [1-6].

One of the sciences imposed in order to prevent and fight against criminality is the forensics. The discipline of forensics regarding the fakes in documents has been common since already in the Roman law of Lucius Cornelius Sulla, which provided harsh punishment for such unlawful acts [2]. In recent times, the criminal investigators specialists in the documentary fraud were faced with a variety of fake types in travel documents. Counterfeiters have used various methods, some simple, resulting in raugh fakes, noticeable by naked eye, while for others they used improved techniques, able to lead in error even on specialists. Travel documents produced by these persons are used especially by traffickers in human beings, by cross-border terrorist groups, by dangerous criminales circumventing prosecution or circumventing the deprivation of liberty, as well as by those who come from poor countries [5,6].

That's why one very important thing to know by those working on the verification of such documents in the first line of control, consists in a modicum of safety elements of these documents. Also, to reduce the number of people traveling with false or falsified documents, EU Regulation 2252/2004 has imposed some standards for security features and biometrics in travel documents, issued by

Member States. Thus, it has sought to reduce the number of those who are trying to use false or forged travel documents, while respecting international technical norms and standards ISO (International Organization for Standardization) and the recommendations of ICAO (International Civil Aviation Organization) [7].

Below are listed a few items and print methods used in travel documents, methods of falsification and forensic research of these documents and the electronic travel documents [1].

Safety elements and methods of printing the travel documents

An important safety aspect is the the *watermark*. This is done in the manufacture of paper using watermark cylinders, the several types being: watermark without shadow and embossed (negative), mass watermark that is shaded but presents no relief (positive), watermark round shape that is shaded and has a relief imperceptible to the touch (combined) and electro-type watermark. The electro-type electro-type watermark is more recently introduced in travel papers, consisting of numbers or letters on small portions and is made by electrolysis [8].

Other safety features to be followed when examining the travel document are the *latent image*, the *retro-reflective image*, *the optical variable image*, the *hidden image*, *fluorescent impressions*, *kinegrams*, *holograms*, *the thread-safe*, *fibers*, *planchettes*, the encoded image (IPI) [9, 10].

The *latent image* is an image that can be clearly deciphered only if it is viewed from a particular angle. The *retro-reflective image* is a picture visible only with the aid of a coaxial light lamps, type 3M, which uses a focused beam of light, while the *optical variable* one changes color if it is viewed from different angles of view, because of the use of metallized iridescent ink. The *planchettes* are strewn randomly across the still wet paper, during the paper manufacturing process, being wether iridescent, or visible in white light or ultraviolet light. The *fibers* are strewn randomly across the unfinished paper still wet path, being visible in white light, reacting in ultraviolet rays, visible only in white light or invisible in white light, but chemically reacting under ultraviolet rays [9].

The *encoded image* (IPI) is an image carried out by means of specialized software tools. This includes individual information about the holder's name, document number, date of birth, which are integrated in the photograph or static information such as the name of the country, integrated into the background of the drawing. The information is invisible to the naked eye, because they are hidden and cannot be seen but with a plate or with a special laboratory equipment (scanner or camera with computer, equipped with image processing software). *Optically variable image* (OVI) is carried out by means of inks that contain variable pigments from the optical point of view, showing significant changes in colour (strong variations of color) depending on the angle of observation or lighting. The inks used to produce optical variable images are composed of micro-flakes located in several layers in a transparent ink medium. The pigment flakes are

microscopic optical elements which select the frequency band (interference filters).

Background printing is usually a geometric drawing, fine and visible printed on the sheet, forming a background for the text to be printed. This is usually accomplished with a pattern offset. *Simultaneous printing* is a drawing made in the same way, both on the front and on the back of the tab. When looking to the sheet transparency, all the drawing elements match in perfect overlay. Intaglio printing is a printing of an engraved form, where the image, specifically the ink, lies in the upper part of engraving prominents, the image being discerned by touch. At the Rainbow type printing, the colors are mutually pervading each other, without a clear line dividing them. Guilloche printing type is a fine print of an image formed by the imterlacing of decorative curved lines.

The printing methods of travel documents featured by EU regulations are laser engraving, laser punching, inkjet printing and laser printing, the thermotransfer and thermosublimation method, offset printing and methods using photographic technique. Laser engraving is a relatively recent method used for newer travel documents made by polycarbonate (ex: E Sheet passport, residence licences, driving licences, ID cards etc.). Using this method, you can print the data of a person's identity, photo, series and number of documents. A feature of this print is the fact that it is carried out only on polycarbonate and is only black and white [7].

The laser punching is used as a rule for the photograph in the shade of the travel documents and of the series of travel documents. The mechanical punching is performed by making holes mechanically (by perforation or punching) in order to incorporate a number or a motive in one document.

The document numbers are punched according to a regular arrangement, stencil type, with circular holes of equal size, always pierced in the same direction. Mechanical punching is recognized by high margins ("burrs") which can be felt on the verso of the support. Thermotransfer is carried out using a waxed foil, which have printed the photograph and identity data using the basic colors (yellow, cyan, magenda and key (black)), while thermosublimation is performed by means of a waxed foil, but images are printed using a device with warmed needles which disperses ink.

Offset printing is accomplished by a process of indirect printing text or image transferred onto a cylinder covered with a rubber surface and from there, they are printed on. Offset printing is based on the principle of mutual rejection between water and fat, is characterised by uniform distribution of ink and precise edges with limits The printing and the nonprinting area are on the same plane of plate printing [11-14].

For the electronic travel documents they are used the same printing techniques and safety elements, only that they may have in addition to the other documents, the person’s digitized fingerprints and digital photography, embedded in returnee chip [13].

These documents having the safety sheet in polycarbonate, use the laser method of engraving, so they are made only in black and white. However, in the

last period some documents made from polycarbonate began to be printed using also color, by inkjet printing. Polycarbonate sheet is made of several layers of polycarbonate, which later, by hot pressing, are mutually pervading eachother, resulting thus the polycarbonate sheet.

Using the base colors (cyan, magenda, yellow and key (CMYK)), the ink is deposed on the polycarbonate layer, and while hot pressing, the colors are pervading eachother, resulting the image. This is an inkjet printed image, made by innosec fusion technique [15].

Operating and Research Criminology Methods for Counterfeit Travel Documents

The partial false consists in replacing a portion of the travel document, so that the legal effects of the travel document be completely other than those for which it was originally established [16]. The partial false can be acieved by mechanical or chemical means. Mechanical falsification is examined and discovered by means of optical (increasing) devices (hand glass, stereo hand glass, microscope, stereo-microscope, epidiascope projector, video-spectral comparator), using perpendicular or lateral light under different degrees of bends [17]. By using infrared light it can be located the mechanical delete from a document. (Fig. 1a). More info regarding the mechanical wiping can be obtained by using the white light. Thus it can be seen that the background picture is damaged where it has been mechanically altered, the microtext is destroyed, and the paper is scratched in that place (Fig. 1b).

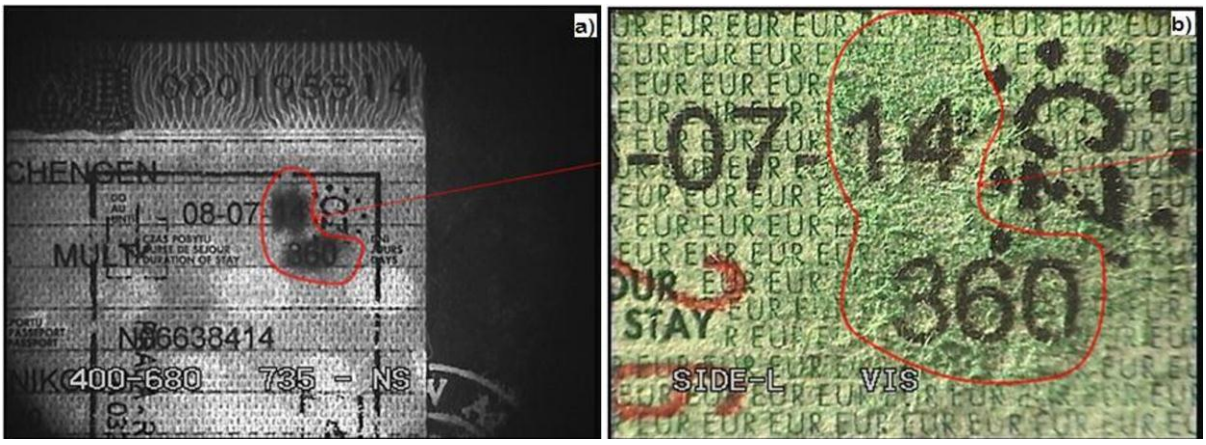

Fig. 1. Highlighting the mechanical wiping in infrared light (a) and in white light (b)

Forgeries by chemical agents are discovered and researched by UV beams as well as with special chemical compounds. Also at the time of mechanical or chemical interventions on document are destroyed the security elements, background design being erased and filigree destroyed. When a travel document is suspected of forgery, the forensic expert examines the travel document by means of laboratory techniques, in order to determine the way it has been falsified (removal of text, numbers or letters, covering of the text, changing, adding or interlacing the text, cutting and reconstitution of some files or replacement of the photograph, partial counterfeiting of the document etc.).

Removal of text, numbers or letteres is usually used in case of names and first names or of special signs. Covering of the text is achieved by portions. This is generally a rough workmanship, discerned by the naked eye. Changing, adding and interlacing of text is achieved by changinf of lettters and numbers or by interlacing of text in the remaining free spaces. By this method one can falsify the name, first name, date of birth, date of issue and the validity of the document. Cutting and reconstitution of tabs is to detach a portion of an authentic document and pasting it to another document.

As a rule, portions of identity data or with diverse visas are detached and transposed to the new set up document, which suffered also a detachement of a portion with the same shape as the new one to be entered. The replacement of the photograph is made in order to enable the use of the document by another person than the holder. The partial counterfeit of a travel document is a relatively new method of counterfeiting, but it was greatly expanded in the last period.

Thus, from the original passport are unshackled the data tab of the identity of the holder and its correspondence and replaced with other tabs of the same type of document or falsified by printing techniques. Also, in the counterfeit document misses the IPI.

In figure 2 there is a document in which the e-sheet has been replaced. When looking through the white light it can be discoverved large differences between authentic and counterfeit document.

GENUINE **FORGED**

Fig. 2. The e-sheet in white light of an authentic and a counterfeit document

An essential element that suggests infringement is that photographs have different raster, although both were printed laser colour (Fig. 3). In the case of genuine photograph (Fig. 3a), points are aligned on the vertical and horizontal, while in the counterfeit (Fig. 3b) points are aligned diagonally.

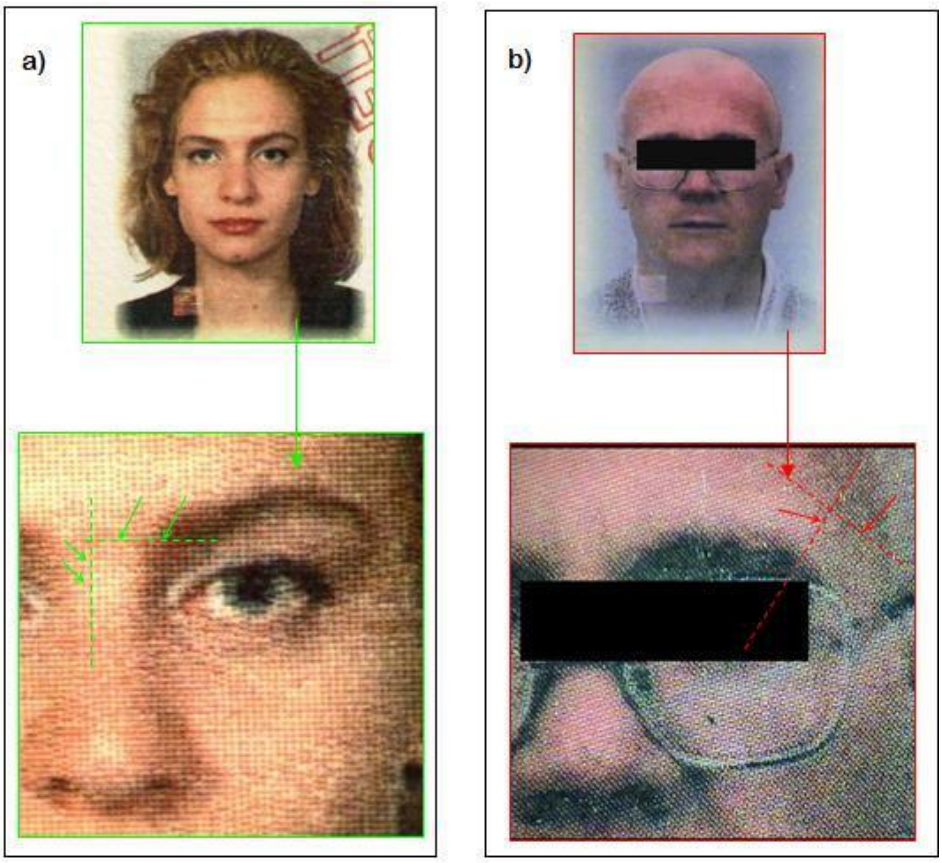

Fig. 3. Increased image of a genuine document fragment (a) and of a counterfeit (b), highlighting the different alignment of the rasters

When the document is viewed in UV light, one can identify other elements suggesting infringement: lack of greenish yellow fibers of the counterfeit and deterioration of the letters BGR (Bulgaria) around the photo in the shadow (Fig. 4).

Fig. 4. Genuine document image in UV (a) and of the counterfeit (b)

The total false (counterfeiting) consists in infringement of a document in its entirety [2,7]. This can be achieved by different individuals or organizations concerned in illicit activities. At present, different individuals and organizations

specializing in such actions, use of the most advanced techniques with cutting-edge equipment available (special printing machines, photocopying etc.), managing to infringe several types of documents, some close to the original, which are more difficult to uncover. One can notice by forensic examination of these travel documents discordances with the original print. The size of the letters and numbers are higher, the filigree is missing or different from the original one.

Also, the dimensions of the document can be other than those of the original, missing planchettes, fibers, the paper-covering way being different, and the type of paper used to produce the document tabs can be different too. An example of a totally fake is illustrated in figure 5 (right), looked into the white light one can notice differences between the colors of the background of the authentic document (Fig. 5 a) and of the counterfeit (Fig. 5 b). Also, the page with identification data in the authentic document is in polycarbonate, while in the faked one is not. The way of printing the background design and the identification data of the holder differ in the counterfeit.

Fig. 5. Image of an authentic document (a) and of a counterfeit (b)

viewed in white light

Using enhancing equipment (stereomicroscope, video spectral comparator), differences between the way of printing the fake document (Fig. 6 a,c) by comparison with the authentic, become apparent (Fig. 6 b,d). The authentic, whose substrate is polycarbonate, holder's image and its identification data are made by laser engraving and photography contains curved lines that are perceptiible by touch. It also has alternating MLI in holder's birth date and initials of the State depending on the angle of view, authentic photograph rasters are positioned vertically, while the counterfeit's are oblique.

Counterfeit document, whose substrate is a laminate of paper, is laser printed black and white, without having the oblique lines which provide perceptible touch to the bearer's photograph.

MLI of the counterfeit document misses, as the substrate is paper and couldn’t be copied or replaced.

As a feature of polycarbonate documents, they can be printed by laser engraving, by comparison with documents made of laminate of paper, whose data cannot be printed by laser engraving as the paper substrate would burned.

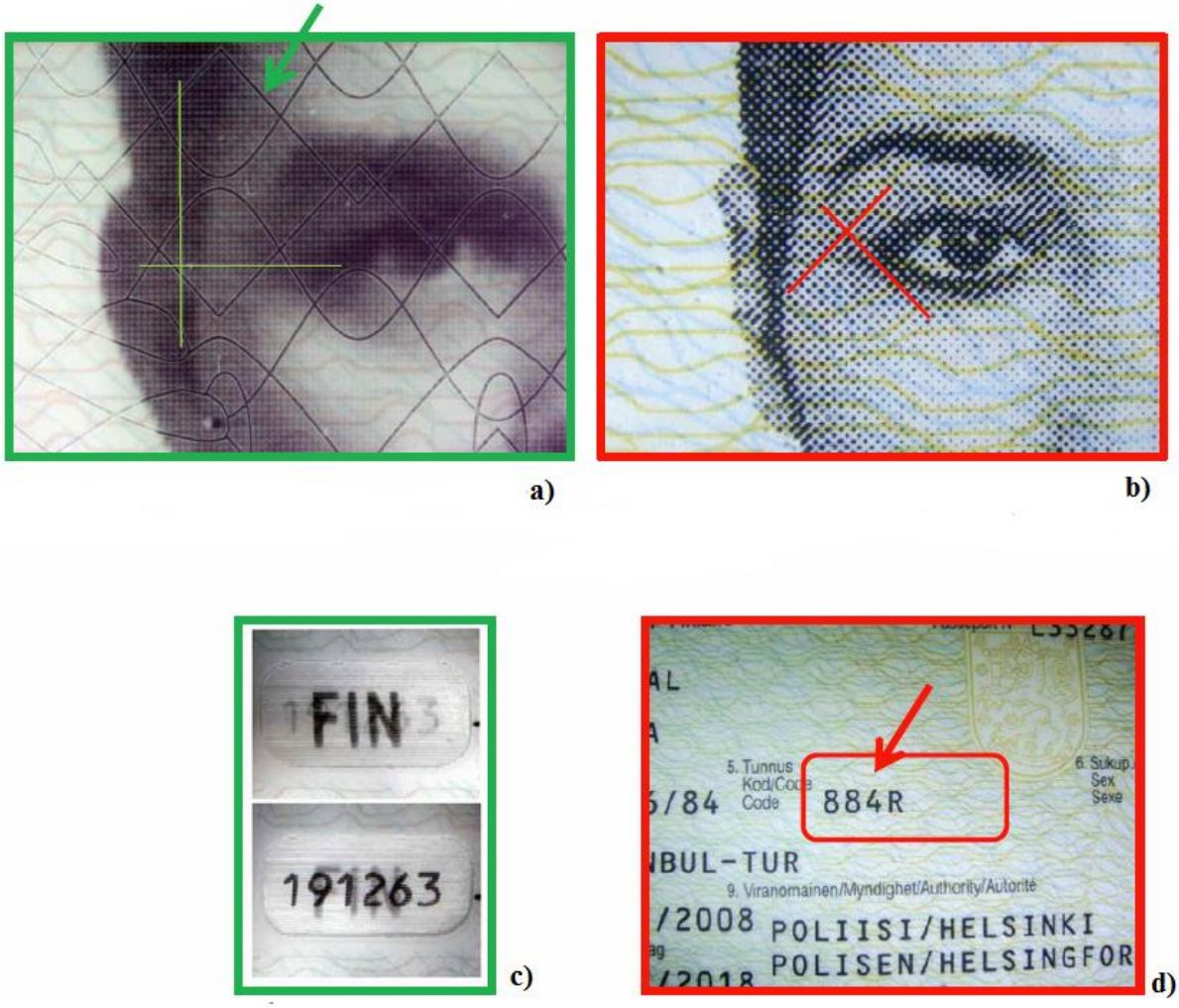

Fig. 6. Image of an authentic document (a,c) and of a counterfeit (b,d), highlighting the printing type and MLI

In the authentic document (Fig. 7 a), on the first inner cover can be noticed the inniatials of the state, document series made by high-tech print and perceptible by touch, while guilloche drawing is accomplished by intaglio printing.

In the counterfeit document (Fig. 7 b) miss the state innitials and the document series, while the guilloche drawing are achieved by offset printing.

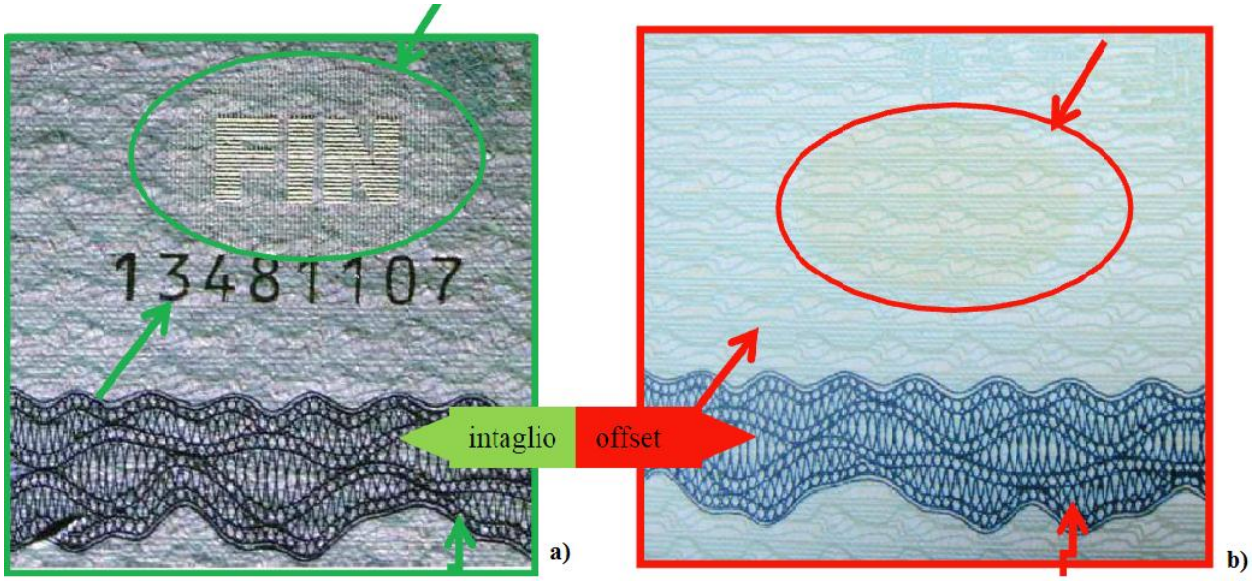

Fig.7. The way of printing of the first inner cover
of the genuine document (a) and of the counterfeit one (b)

When looking in the transmitted light to the authentic document, one can see the security thread and the watermark combined, spread over the entire surface of the tab. In the counterfeit document, the security thread and the watermark miss. One can notice a trial to imitate the watermark by overprinting it on every tab of the document. It is also noticed that the paper constituting the counterfeit document tabs is matte, because light transmitted through it doesn't intrude in comparison with authentic, where light penetrates through the tabs.

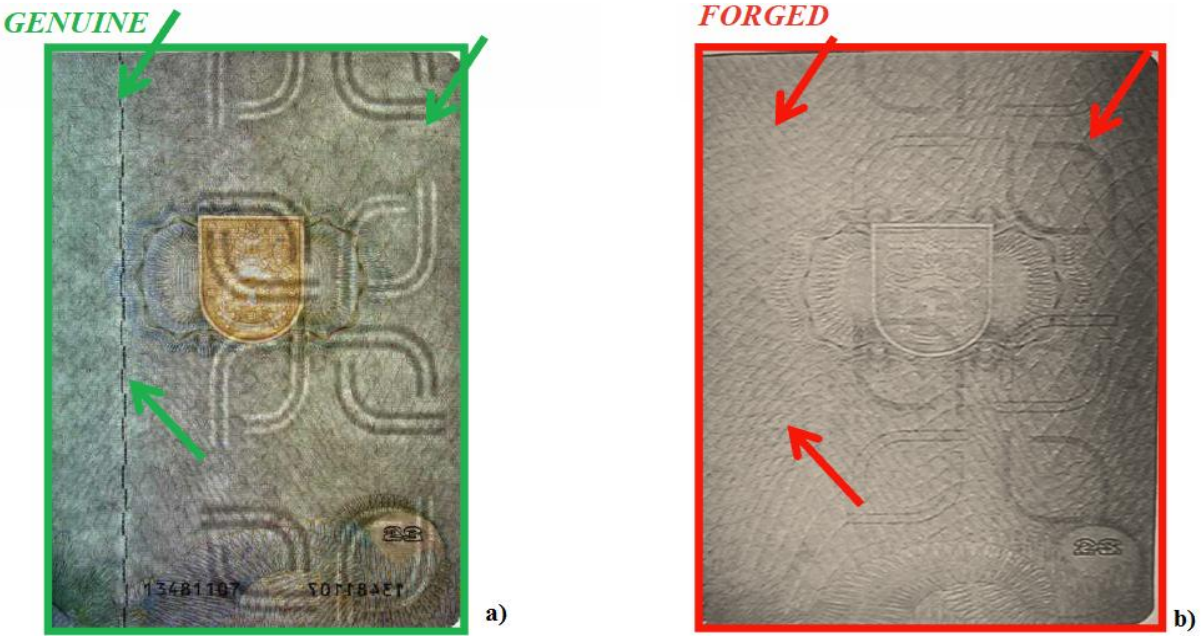

Fig.8. Exposure to the transmitted light
of the genuine document (a) and of the forged (b).

When exposing to the UV light of the genuine document (Fig.9b) one can notice microtext lines with the name of the state and its innitials in blue reaction and also the fact that the paper is absorbing the light. In the forged document (Fig.9b) the UV reaction almost misses and the paper rejects the UV light.

Fig. 9. Exposure under UV light of a genuine document (a) and of a forged (b)

Valid blank travel documents purchased illicitly are the most difficult to demonstrate, as they are authentic and comply with the conditions of form and substance. These documents are bought immediately after manufacture from the producer on illicit ways and are filled by unauthorized persons. When there is reason to believe that a travel document is doubtful, the forensic specialist shall verify the technique of printing the data holder [18]. There are measured the dimensions of letteres and figures, there are compared the printing technique with the technique used in a document filled by the competent authorities. It is also carried out a detailed inspection on the person and their luggage to see if it's not on them any other document of the true identity [18-21].

The way of falsification or counterfeiting, as well as the modality of forensic research of the e-travel documents is similar to the other documents, only they have in addition the chip with radio waves (RFID) [22-25]. This contains the person's biometric data that can be read using a chip reader at small distances [22]. A particularity of these chips is the fact that it cannot be rewritten, but merely cloned. In order to prevent their cloning, it has been introduced a security code in these chips. When they are written in the document, they are covered with an ensuring protective foil [26, 27]. Despite introducing these security elements, it has been demonstrated that this chip can be easily cloned, whitout too many expenses. In order to do this it is needed just a computer with a special soft and a card reader, being possible to read tehm at a distance up to 30 m. The cloned data can be transmitted on another chip or changed on computer and then transmitted on another chip, which can be used for a forged travel document, previously illicitly purchased in blank and filled by unauthorised persons. This falsification method is hard to be detected, as the

cloned chips are read by readers, the cloning being demonstrated just after a special forensic examination, by IT experts criminal investigators. The chip can be also destroyed by frying into a microwave oven or by bending the chip zone until its antenna is broken, what remains being just the cracked or damaged polycarbonate. These methods are relatively easy to identify, as these chips cannot be read anymore.

Conclusions

Today, the risks and threats facing a state become more and more of a cross-border character and can be kept under control only through active international cooperation. Falsification or counterfeit of the travel documents, vizas, cheques and currencies, stamps, value certificates and other securities issued by states, credit cards and means of pre-payment are serious crimes that belong, in most cases, to networks of cross-border organized crime. The documents are records of a particular meaning, therefore their forensic research is important, but difficult at the same time. In general, the means available to the offenders are in step with the latest technical breakthroughs, which makes inevitable the permanent increase in the technological level and measures in response. Expert bodies in all countries need modern facilities and means of document forensic investigation. Technical and scientific data necessitates a systematic renewal, because the counterfeiting methods and processes are rapidly changing and new possibilities of alteration of documents are appearing. Despite the world's high level of development, falsification of documents remains a current problem, a crime that is increasingly of an international character. This facilitates the fulfillment of other serious offences, such as trafficking in human beings, drug trafficking etc. Under increasing threat of terrorism or other crimes which put in danger the international community, it is necessary to implement measures of safety, both at border crossing points, as well as compliance and improvement of safety elements regarding the issue of documents.

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